MIMICO CREEK
DRY WEATHER OUTFALL
SURVEY

TECHNICAL REPORT #12

A REPORT
OF THE

TORONTO AREA WATERSHED
MANAGEMENT STRATEGY
STEERING COMMITTEE

November 1987

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STEERING COMMITTEE

By:

CANVIRO Consultants Ltd.

Kitchener, Ontario

NOVEMBER 1987

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TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

Project Objectives

During the fall of 1984, a dry weather outfall survey was conducted on the sections of Mimico Creek within the City of Etobicoke boundaries. The survey was conducted as part of the ongoing Toronto Area Watershed Management Strategy Study (TAWMS) and was carried out with regard to the following specific objectives:

1. To inventory and document all existing outfalls on Mimico Creek within the City of Etobicoke.

2. To assess the loadings and concentrations of selected contaminants discharged in dry weather from the existing outfalls to Mimico Creek.

3. To identify and prioritize, on the basis of observations, outfalls discharging contaminants in concentrations in excess of modified municipal sewer-use bylaws.

Methodology

The field program was conducted in three phases: pre-survey, consecutive screening and intensive sampling.

Pre-Survey

During this phase, historical outfall information was collected from the City of Etobicoke to assist in reach designation and in the identification of potential problem outfalls. Information collected included municipal outfall maps, historical bacteriological data from selected outfalls and stream station water quality data (where available).

As well, field crews were equipped and trained in survey methodology.

Consecutive Screening Surveys

The second study phase consisted of two consecutive screening runs. All outfalls were inventoried and documented. Where possible, samples were taken, flowrate was determined and other field measurements were made.

Based upon the analytical results from the screening runs, outfalls with significant levels of contamination were selected for subsequent intensive sampling.

Intensive Sampling

The final phase of the field program consisted of intensively sampling the above screened outfalls for selected parameters, up to 4 additional times.

Outfall Classification

Outfalls were then classified on a parameter by parameter basis to assist the municipalities and the Ministry in prioritizing problem outfalls. The Metropolitan Toronto sewer-use bylaw modified to include fecal coliform and TKN criteria was used to assist in outfall categorization. Outfalls exceeding modified bylaw limits and having a minimum of 4 samples for a given parameter, were classified as being in Group A. This group was considered to have sufficient information to define the extent of any contamination problem.

Outfalls sampled less than four times but which exceeded modified bylaw limits for one or more parameters were classified as Group B. For the most part, this group was felt to be of less priority than the Group A outfalls and should be considered to have insufficient data to assess the extent of contamination (i.e. additional outfall sampling is needed). Both Group A and B outfalls were ranked by the number of bylaw violations and by the average outfall discharge load for all parameters except fecal coliforms. Fecal coliform violations were based solely on loadings.

Results and Discussion

A total of 194 outfalls were inventoried, 87 or 45% of which were actively flowing. Of the active outfalls, 72 or 83% were sampled at least once and 60 or 69% were sampled at least twice. Fifteen (15) or 17% of the outfalls were not sampled due to insufficient flow. Thirty three outfalls were selected for intensive sampling.

A total of 104 L/s of effluent was measured to be entering the creek. The majority (80%) of the effluent entered in Reaches MA, MB, MG, and MH.

Fecal coliform densities violated modified bylaw limits in 22% of the outfalls sampled. Iron and BOD criteria were also frequently violated (24% and 22%, respectively).

In total, 26 Group A outfalls, which represents approximately 13% of the total number of outfalls inventoried, and approximately 38% of the total number of outfalls sampled, were identified. Twenty-two outfalls were categorized as Group B, of which 4 outfalls were common to both Groups A and B.

Outfall MA 23 was found to be the greatest single contributor of pollutants to the river. It accounted for the following percentages of the total input of each pollutant into the river: fecal coliform 22%, BOD 34%, total phosphorus 70%, suspended solids 16%, TKN 23%, lead 21%, zinc 45%, chromium 57% and iron 16%.

Recommendations

i) Outfalls in Group A which are consistent contributors of pollutants and are therefore of high priority, should be investigated to locate the source of contamination.

ii) Outfalls in Group B which are listed as high priority should have additional sampling conducted at the outfall to better define the extent of the problem.

iii) Submerged outfalls should be investigated at the first upstream manhole, not under the influence of river water, to assess the quality of any flows.

RÉSUMÉ

Le présent rapport contient les résultats d'une étude menée sur l'ensemble des exutoires se déversant par temps sec dans le ruisseau Mimico. L'étude consistait en deux opérations de sélection visant à repérer les exutoires présentant un niveau sensible de pollution, suivies par des prélèvements répetés d'échantillons dans ces exutoires. Au total, on a repéré et inventorié 194 exutoires, dont 72 ont fait l'objet de prélèvements d'échantillons au cours des opérations de sélection et 33 ont été soumis à un échantillonnage intensif. Environ 22 pour 100 de tous les exutoires analysés montraient un taux de coliformes fécaux supérieur au critère établi. Nous avons noté peu de cas de problèmes relatifs à la présence de métaux lourds. Vingt-six exutoires jugés hautement prioritaires devraient faire l'objet d'études visant à trouver la source de pollution; 22 autres exigent des échantillonnages supplémentaires afin d'évaluer l'étendue du problème.

1.0 INTRODUCTION

1.1 Background

The Mimico Creek watershed encompasses an intensively urbanized portion of Metropolitan Toronto and the adjacent City of Mississauga (approximately 90 km^2 in area). Recently, concerns have been expressed regarding the water quality of Mimico Creek and its potential effect on the Lake Ontario waterfront. This prompted the Ontario Ministry of the Environment, through the Toronto Area Watershed Management Strategy Study (TAWMS) to commission an inventory and dry weather survey (quantity and quality) of outfalls discharging to Mimico Creek within the City of Etobicoke. The following report presents the results of the survey conducted during the summer and fall of 1984.

1.2 Project Objectives

The Mimico Creek dry weather outfall survey was designed to meet the following major objectives:

1) Inventory and document all existing outfalls on Mimico Creek within the City of Etobicoke.
2) Assess the loadings and concentrations of selected contaminants discharged in dry weather from the existing outfalls to Mimico Creek.
3) Identify and prioritize, on the basis of observations, outfalls discharging contaminants in concentrations in excess of modified municipal sewer-use bylaw limits.

2.0 DESCRIPTION OF STUDY AREA

2.1 Land-use Activities and Population

The study area encompassed only that portion of Mimico Creek that falls within the boundaries of the City of Etobicoke. The upper reaches of Mimico Creek ($\simeq$ 45% of the watershed) located in the Cities of Mississauga and Brampton were not examined. Approximately 32% of the City of Etobicoke lies within the watershed with an estimated population of 95,721 within the study area.

Figure 1 presents the creek watershed boundaries and land-use activities within the City of Etobicoke.

The lower watershed is virtually all urbanized, although some open space areas (parks and golf course) are adjacent to the creek. Industrial activity is prominent in several core areas, most notably north of Highway 401, south of Dundas St. and west of Islington Ave, and south of the Queensway.

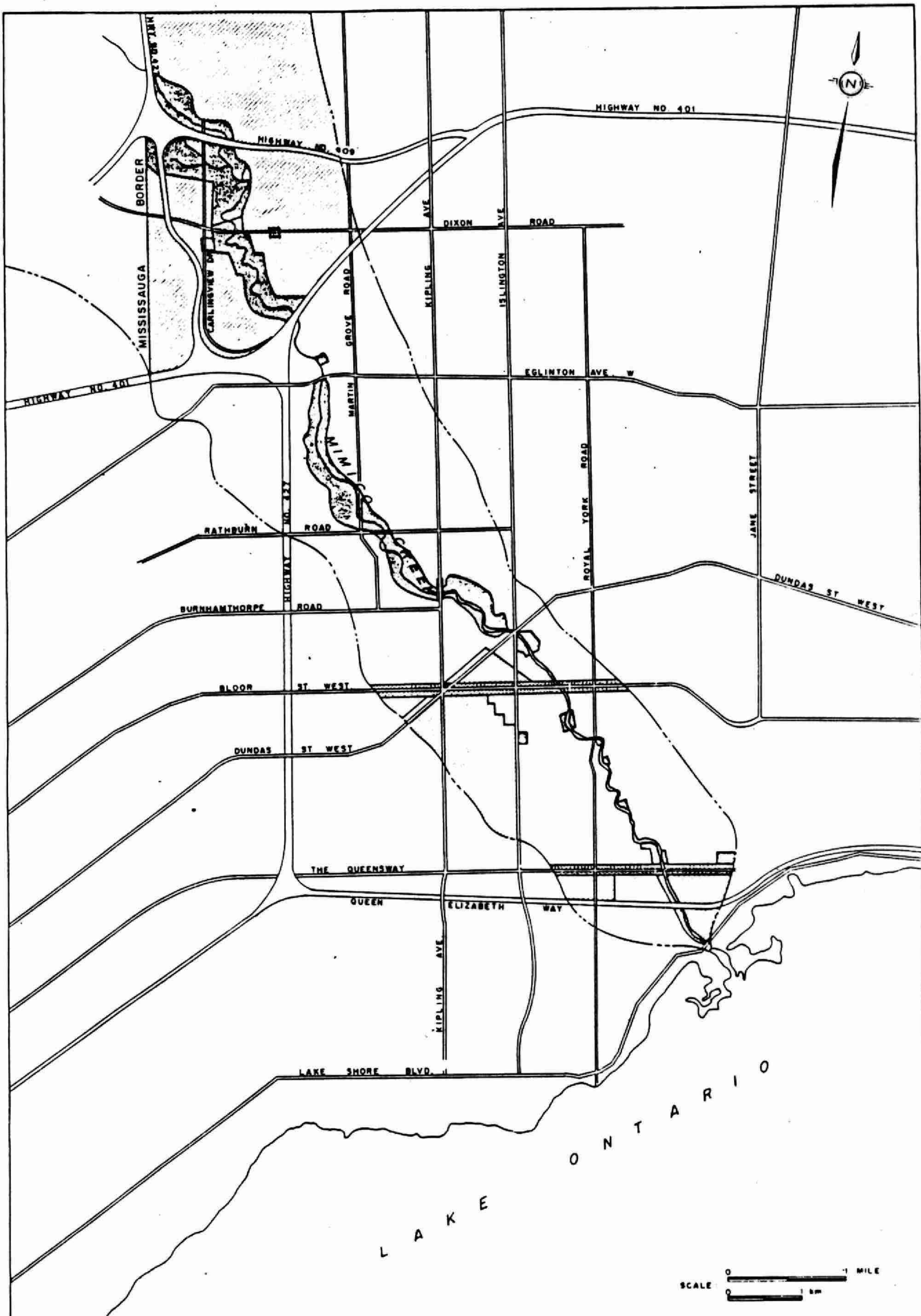
Mimico Creek itself is channelized through approximately 20% of its length in the City of Etobicoke. There is one known historic landfill site located along the east bank of the creek between Carlingview Dr. and Highway 427.

2.2 Dry Weather Inputs to Mimico Creek

Important sources of dry weather discharge to Mimico Creek include:

- Stormwater outfalls discharging infiltration flows which may be contaminated by domestic, commercial or industrial inputs, or through cross connections.
- Discharge from drainage ditches or tributaries which may be contaminated by urban, industrial or agricultural discharges.

There are no known combined sewer overflows, or industrial effluents discharging to Mimico Creek.



LEGEND:

INDUSTRIAL
PARK / GOLF COURSE
COMMERCIAL
RESIDENTIAL
BOUNDARY OF WATERSHED

CANVIRO CONSULTANTS LTD

FIGURE 1 — CITY OF ETOBICOKE LAND USE ACTIVITIES IN THE MIMICO CREEK WATERSHED

3.0 MUNICIPAL AND MODIFIED SEWER-USE BYLAWS

A modified version of the Metropolitan Toronto sewer-use bylaw was used to determine if outfall dry weather flows were contaminated. The bylaw was extended to include TKN and fecal coliform criteria. A TKN criteria was specially developed for this study using the Metro ammonia bylaw limit of 10 mg/L and based on the assumption that ammonia constitutes 50% of the TKN concentration (i.e. TKN = 10 x 2 = 20 mg/L).

The fecal coliform guideline was developed by the Tawms Abatement Committee. The guideline consisted of the following multiple conditions:

i) average loading calculated from four or more samples in excess of 10,000 org/s, and

ii) average flow on the four or more sampling occasions in excess of 0.1 L/s.

The relevant bylaw limits for both Metropolitan Toronto and the City of Etobicoke as well as the modified limits used for screening are presented in Table 1. A full copy of the Metropolitan Toronto sewer-use bylaw is provided in Appendix IX.

The City of Etobicoke's own bylaw limits were not employed for the sake of consistency with other studies on the Don and Humber Rivers.

TABLE 1. MUNICIPAL AND MODIFIED STORM SEWER-USE BYLAW CONCENTRATIONS

PARAMETER	UNITS	CITY OF ETOBICOKE BYLAW	METROPOLITAN TORONTO BYLAW	MODIFIED BYLAW
Ammonia	mg/L	10	10	10
TKN	mg/L			20
Copper	mg/L	1.0	1.0	1.0
Iron	mg/L	1.0	1.0	1.0
Lead	mg/L	1.0	1.0	1.0
Zinc	mg/L	1.0	1.0	1.0
Chromium	mg/L	1.0	1.0	1.0
Total Phosphorus	mg/L	1.0	1.0	1.0
BOD	mg/L	15	15	15
Suspended Solids	mg/L	15	15	15
Fecal Coliform	-	2400 org/100 mL	NA	(1)
Phenolics	ug/L	20	20	20
pH	pH	9.5 < pH < 6.0	9.5 < pH < 6.0	9.5<pH<6.0
Temperature	C°	65	65	65

Notes: (1) See text for complementary condition

4.0 SURVEY METHODOLOGY

4.1 Field Program Design

The field program was conducted in three phases as follows:

1) Screening Run One
All outfalls discharging into the river were inventoried. Flows of all active outfalls were sampled and flow and other on-site measurements were taken.

2) Screening Run Two
All newly found outfalls were inventoried. Flows from all outfalls including those previously sampled during screening run one were sampled and flow and other on-site measurements were taken.

3) Intensive Survey
Additional data was collected (quality and quantity) on up to 4 occasions for selected outfalls which the previous screening runs had indicated exceedence of specifically formulated screening criteria for one or more parameters. These screening criteria are not necessarily the same as the modified bylaw limits used for outfall classification.

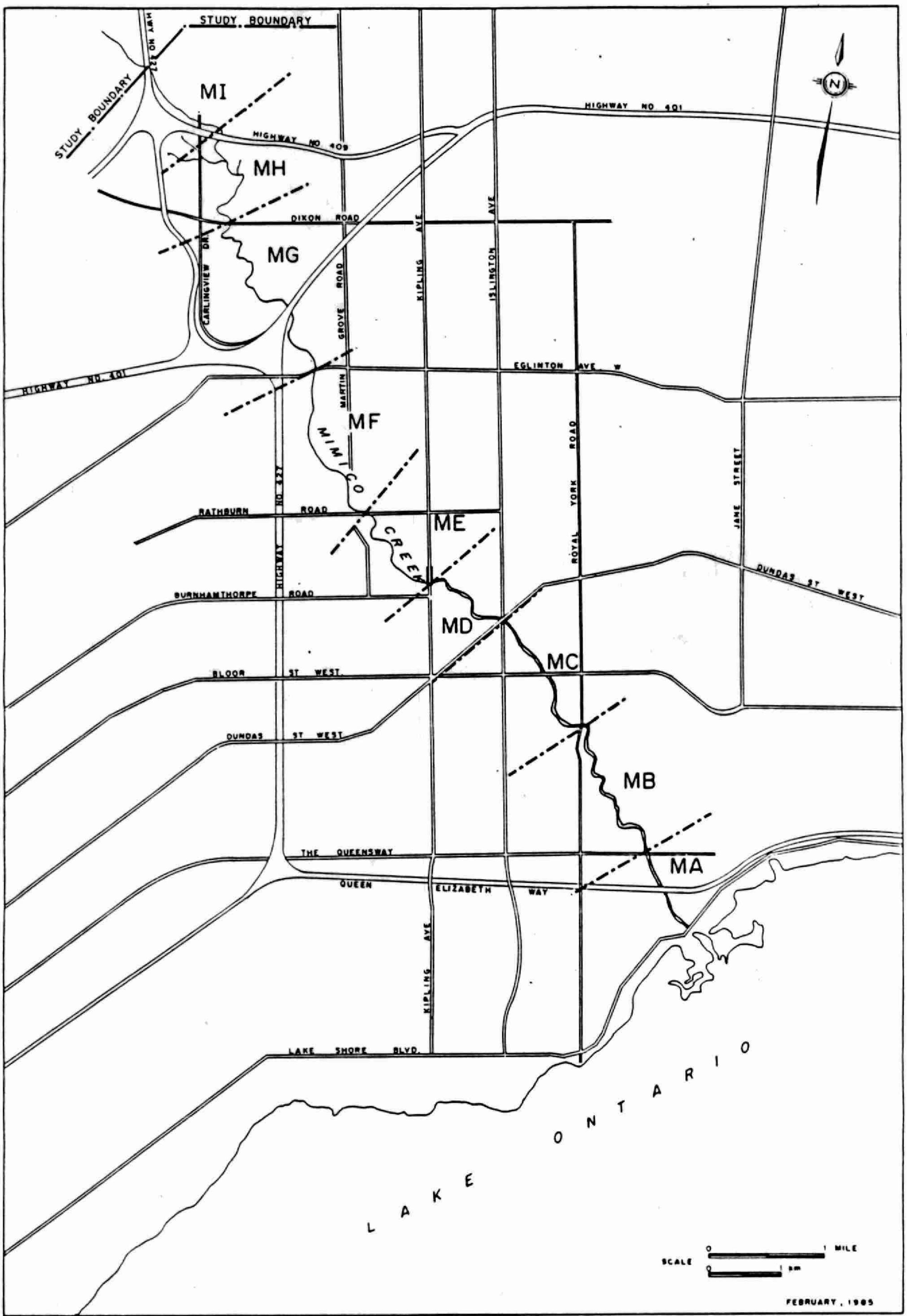
4.2 Survey Methodology

4.2.1 Pre-Survey Activities

Historical outfall information was collected from the City of Etobicoke to assist in reach designation and in the identification of potential problem outfalls. Information collected included municipal outfall maps, historical bacteriological data from selected outfalls and stream station water quality data (where available).

Prior to the initiation of the field program, in-depth training of the field crews in survey methodology was conducted. Crews were trained in proper sampling techniques, flow measurement, preservation and submission of samples, proper documentation, use of survey equipment and safety procedures.

During the pre-survey phase, the creek was divided into reaches which were letter coded. Divisions were based on street crossings and to isolate potential problem areas. The designated reaches are shown in Figure 2.



LEGEND:

REACH BOUNDARY

STREAM CONDUCTIVITY STATION

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FIGURE 2 – REACH DESIGNATIONS FOR MIMICO CREEK OUTFALL SURVEY

4.2.2 Screening Surveys

On dry weather days, crews walked in an upstream direction, inventorying all outfalls encountered. Each visit to an outfall was documented on a field sheet. If the outfall was active (i.e. possessed sufficient flow to enable sampling), samples were obtained and flow and other measurements (e.g. temperature) were made. Conductivity and pH measurements were obtained from a portion of one of the samples. Similar techniques were employed for each of the screening surveys.

Field supervisors accompanied crews in the initial stages of the screening runs to insure standardization of survey procedures.

Determination of Dry Days

On the morning of each working day, water samples were collected from Mimico Creek at Puckeridge Cres. and Milburn Dr. for determination of stream conductivity. This conductivity was used to determine whether or not the creek was under dry weather conditions. Dry days on which samples were taken were determined to have conductivities greater than 600 mohs/cm. During the latter stages of the survey, the salting of roads following snowfalls greatly influenced river conductivities. During these periods, conductivities above 4000 mohs/cm were deemed to be wet weather conditions.

Outfall Documentation

Each outfall was assigned a distinct number (even numbers on the east side and odd numbers on the west side of the creek) which was recorded on a field map and on a field sheet. The number was painted on the outfall and the outfall photographed. A field sheet was used to document the outfall location, stream reach, the number of the outfall, its physical characteristics and flow status (i.e. flowing, dry, submerged). An example of a field sheet is provided in Appendix II, as well as a description for each field sheet entry. Documentation of an outfall during subsequent runs was less extensive in order to reduce needless replication.

Differences in documentation between the three study phases are indicated in Table 2.

TABLE 2. OUTFALL DOCUMENTATION OBTAINED FOR VARIOUS SURVEY RUNS

CATEGORY	RUN ONE	RUN TWO	INTENSIVES
Crew	x	x	x
Date	x	x	x
Time	x	x	x
Outfall Number	x	x	x
Municipal Outfall Number	x	x	x
Stream Name	x	x	x
Reach	x	x	x
Municipality	x	x	x
Street Location	x		
Size	x		
Shape	x		
Material	x		
Mapping	x		
Photograph	x		
Samples	x	x	x
Last Precipitation	x	x	x
Outfall Flow Measurement	x	x	x
Conductivity	x	x	Optional
pH	x	x	Optional
Temperature	x	x	x
Observations	x	x	x

Effluent Sampling/Analysis

Samples of effluent from active outfalls were obtained for the determination of conventional and bacteriological parameters as well as for heavy metal determinations. Samples were also taken for phenols (i.e. phenolic equivalent) when observations warranted (e.g. gasoline smell).

Table 3 summarizes the analytical parameters, the types of sample container used and the methods of sample preservation employed. Samples were transported in coolers with ice packs during warm weather and were stored in a walk-in cooler at 4°C until submitted for analysis on the next working day. Bacteriological samples were submitted and analysis initiated within 24 hours of being collected.

TABLE 3. SAMPLE CONTAINERS AND METHOD OF PRESERVATION FOR WATER QUALITY PARAMETERS

PARAMETER	SAMPLE BOTTLE DESCRIPTION	METHOD OF PRESERVATION
Biological Oxygen Demand (mg/L) Total Kjeldahl Nitrogen (mg/L) Residue Particulates/ Suspended Solids (mg/L) Total Phosphorus (mg/L)	1 L Glass	Cooled 4°C
Fecal Coliform Bacteria (org/100 mL) Fecal Streptococcus Bacteria (org/100 mL)	250 mL Glass (sterilized)	Sodium Thiosulphate; Cooled 4°C
Zinc (mg/L) Copper (mg/L) Chromium (mg/L) Iron (mg/L) Lead (mg/L)	500 mL Plastic	10 Drops Concentrated Nitric Acid; Cooled 4°C
Reactive Phenolics (ug/L)	250 mL Glass	Cupric Sulphate; Cooled 4°C

Whenever possible, samples were obtained directly from flowing effluent. When necessary, various aids were employed in obtaining all but bacteriological samples. Any equipment used for obtaining samples was thoroughly rinsed with effluent from that outfall prior to its use. Typical aids used included a plastic funnel or beaker, a steel ruler or other flexible devices, or a reverse suction bicycle pump. A list of equipment used by the field crews is provided in Appendix II.

For the most part, outfalls with <0.01 L/s flow were considered insufficient for sampling.

Outfall Flow Determination

Several methodologies were used to determine outfall flows. Whenever possible, a volume over time estimate was obtained by allowing the effluent to flow into a 1 litre plastic beaker or 4.5 litre pail. The fill time was recorded with a stopwatch. This method was considered the most accurate (±10-20% of actual volume) and was used approximately 90% of the time. If this method was not appropriate, a velocity-area technique was employed to estimate flows. Flow area was obtained by direct measurement or estimation (based on partial measurement) in the case of irregular shaped outfalls. Average flow velocity was estimated by time-of-travel measurements of a floating object over a measured distance. The accuracy of this method was approximately ±30-50%.

In the event that none of the above methods could be applied, a visual estimate or a combination of a partial measurement and visual estimate was employed to determine flow quantities. The accuracy of the visual estimate is considered to be approximately ±100%.

4.2.3 Selection of Intensively Sampled Outfalls

Analytical results from the screening runs for each outfall were compared with the appropriate modified bylaw limits. If results indicated that one or more parameters were in excess of limits, the outfall was identified as potentially requiring intensive sampling (up to 4 additional sets of samples and flow measurements). However, due to restrictions in manpower and analytical resources, not all such outfalls were further surveyed. A scheme for prioritizing the severity of outfall contamination was developed and only priority outfalls were intensively screened. For some parameters selection of the screening criteria were somewhat arbitrary. All criteria are presented in Table 4. For parameters for which a loading limit was specified, both the concentration and loading for that parameter had to exceed the criteria to qualify for intensive sampling.

TABLE 4. SCREENING CRITERIA USED TO IDENTIFY OUTFALLS FOR INTENSIVE SURVEYS

PARAMETER	CONCENTRATION LIMIT	LOAD LIMIT
Fecal Coliform	>10,000 org/100 mL	>10,000 org/s
BOD	>15 mg/L	-
Suspended Solids	>100 mg/L	>1,000 gm/day
Total Phosphorus	>10 mg/L	>100 gm/day
TKN	>20 mg/L	-
Iron	>1.0 mg/L	>100 gm/day
Chromium	>1.0 mg/L	-
Lead	>1.0 mg/L	-
Zinc	>1.0 mg/L	-
Copper	>1.0 mg/L	-
Phenols	>20 ug/L	-
pH	9.5 < pH < 5.5	-
Temperature	>65°C	-

Outfalls selected for intensive sampling were assessed for all parameters above modified bylaw limits identified during the two screening runs. In addition to the parameters above the limits, the outfall was analyzed for other parameters useful in characterizing the discharge. BOD, suspended solids and total phosphorus were considered as one group, all metals were considered a second group and bacterial parameters a third group. Crews were also instructed to sample for additional parameters if on-site observations warranted.

4.2.4 Intensive Survey Sampling

An attempt was made to visit all outfalls on the intensive list until all parameters in excess of modified bylaw limits were sampled 4 times. Outfalls selected for intensive sampling based on first screening run results were visited first until all sampling was completed. Those outfalls selected based on second screening run results were then sampled intensively.

Field crews proceeded directly to the outfall using the same procedures as employed during the screening runs. An attempt was made to randomize the time between visits to an outfall with a minimum interim of 1 day and a maximum of 1 week. If an outfall was not actively flowing on any given visit, it was still recorded as having been visited during an intensive run and documented accordingly.

4.3 Sample Analysis

4.3.1 Analytical Methods

The bulk of analyses was conducted under a separate contract by IEC Beak laboratories. Bacteriological analyses were sub-contracted to Young and Associates. The Ministry of the Environment laboratories in Rexdale conducted the analyses of all phenolic samples and those samples submitted for quality assurance. The analytical methods used and detection limits for each are summarized in Table 5.

4.3.2 Quality Assurance

The Mimico Creek study was conducted in conjunction with the Don River Dry Weather Outfall Survey. In order to optimize sample allocations, the quality assurance samples were pooled with the Don River samples.

Starting on October 5, triplicated samples for conventional and metal analysis were obtained from approximately 1 in 20 sampled outfalls. The variance introduced by sampling was determined by comparing the first and second samples, both analyzed by IEC Beak. The variance introduced by analysis was measured by testing the first sample and the third sample (analyzed by IEC Beak and MOE Rexdale, respectively).

Linear regression of the replicated data was used to determine whether there were significant differences in parameter results introduced by sampling and analysis. Differences between the replicated results were felt to be significant if the linear correlation coefficient r was less than 0.95. The methodology used is taken from a MOE report on the evaluation of inter-laboratory comparison data by linear regression analysis (King, 1976).

On November 26, 1984, an inter-laboratory comparison of bacteriological analysis was performed on outfall effluent between the MOE Laboratories and Young and Associates. Field crews collected 2 litres of effluent. The effluent was divided and distributed and analyses were initiated at exactly the same time.

Replicated data were analyzed using a one-way analysis of variance of square root transformed colony counts per filter, per parameter from the sample dilution (or aliquot), giving the best parameter recovery (Horsnell and Young, 1984). No significant differences were noted in replicated samples.

TABLE 5. ANALYTICAL METHODS AND DETECTION LIMITS FOR WATER QUALITY PARAMETERS AT INDICATED LABORATORIES

PARAMETER	UNITS	ANALYTICAL METHODS AND DETECTION LIMITS					
		IEC BEAK	DETECT. LIMIT	MINISTRY OF ENVIRONMENT	DETECT. LIMIT	R. YOUNG AND ASSOCIATES	DETECT. LIMIT
Biological Oxygen Demand	(mg/L)	(SM) Sub-Oxygen Analyzer	0.2	(SM) Sub-Oxygen Analyzer	0.1	N.A.	-
Total Kjeldahl Nitrogen	(mg/L)	(SM) Kjeldahl Digestion	0.01	(SM) Alkaline Phenol Hypochlorite	0.32	N.A.	-
Residue Particles/ Suspended Solids	(mg/L)	(SM) Residue Suspended Particulate	0.5	(SM) Residue Suspended Particulate	1.0	N.A.	-
Total Phosphorus	(mg/L)	Stannous Chloride Method	0.01	Stannous Chloride Method	0.08	N.A.	-
Fecal Coliform Bacteria	(counts/ 100 mL)	N.A.	-	M-TEC	(variable)	M-TEC	10
Fecal Streptococcus Bacteria	(counts/ 100 mL)	N.A.	-	M-ENT	(variable)	M-ENT	10
Reactive Phenolics	(μg/L)	N.A.	-	4-Aminoantipyrene	0.2	N.A.	-
Zinc	(mg/L)	Direct Current Plasma	0.005	ICAP	0.1	N.A.	-
Copper	(mg/L)	Direct Current Plasma	0.005	ICAP	0.1	N.A.	-
Lead	(mg/L)	Direct Current Plasma	0.01	ICAP	0.1	N.A.	-
Chromium	(mg/L)	Direct Current Plasma	0.01	ICAP	0.1	N.A.	-
Iron	(mg/L)	Direct Current Plasma	0.01	ICAP	0.2	N.A.	-

Note: N.A. = Not Analyzed
SM = Standard Method
ICAP = Inductively Coupled Argon Plasma

4.4 Data Base Management

A computerized data base management system was implemented to house the outfall inventory, analytical results and field measurements. The PC/ FOCUS (release 1.0, 1984) software package was employed. Computer hardware included an IBM PC microcomputer provided with a 12 megabyte hard disk and 640K RAM.

The PC/FOCUS program is functionally the same as the FOCUS mainframe program and contains facilities for describing files; for entering, changing and deleting records and preparing reports from the information in the files (Information Builders, 1984).

Files were set up in a multi-segmented file format with a FOCUS suffix. A schematic of the master file segments, their affiliation and their field names within each segment is illustrated in Figure 3. A summary of the master file description and field names used for the survey are provided in Appendix III. A definition of each of these field names is also listed in Appendix III.

Each segment describes either various characteristics of, or observations made, at the outfall. The location segment describes the identification number and locality on the river, while the description segments includes the outfall size and shape in addition to other data. Other segments (e.g. on-site, off-site) contain the date and time of survey, flow, pH and conductivity and all analytical results.

The master file was structured such that records could be sorted by a variety of keys. For example, sorts could be carried out to partition outfalls by reach or outfall type.

Less than or greater than signs were entered, where appropriate, into data fields but were treated as equal signs during computations.

Replicate samples taken on the same day for a given outfall were averaged and treated as a single observation. Outfall concentrations for the period of the study (including all screening runs and intensive sampling) were determined as flow weighted averages. Average pollutant concentrations calculated for a reach or the creek as whole were in turn computed as the flow weighted averages of the individual outfall average qualities (also flow weighted).

```
File Segment Name ------>          LOCATION
File Segment ----------->   01     S3
                           **************
                       ┌ **MUNICIPALITY**
                       | **REACH       **
Fields within          |
                 ----->┤ **OUTFALL NUM **
Each Segment           | **MO-NUMBER   **
                       | **            **
                       └ ****************
                         ****************
                                I
                                I
                                I  DESCRIPT
                            02  I  S1
                           **************
                         **OUTFALL-TYPE**
                         **PIPE-DIM-1  **
                         **PIPE-DIM-2  **
                         **DESCRIPTION **
                         **            **
                         ****************
                         ****************


                                I
                                I
                                I  ONSITE
                            03  I  S1
                           **************
                         **DATE        **
                         **TIME        **
                         **LAST PRECIP **
                         **CREW        **
                         **            **
                         ****************
                         ****************
                                I
                                I
                                I  OFFSITE
                            04  I  S1
                           **************
                         **REPLICANT   **
                         **RTP         **
                         **TOT P       **
                         **RTKN        **
                         **            **
                         ****************
                         ****************
```

FIGURE 3. SCHEMATIC OF MASTER FILE USED FOR MIMICO CREEK OUTFALL SURVEY

4.5 Mapping Procedures

For purposes of documenting the field inventory and subsequent preparation of reach maps, 1:10,000 Metro Toronto municipality maps were used. In addition, City of Etobicoke municipal outfall maps were employed to assist in locating known outfalls.

As outfalls were identified, their location and number was marked as accurately as possible onto the Metro maps. This data was subsequently transcribed onto mylar screens prepared from Metro map originals in order to produce the desired reach maps.

4.6 Classification of Outfalls

Outfalls were classified to assist the City of Etobicoke and the Ministry in prioritizing "problem outfalls" (i.e. outfalls with one or more parameters exceeding modified bylaw limits).

Figure 4 presents a schematic diagram of the classification scheme employed. Based upon this scheme, outfalls were placed in one of four categories as follows:

Group A Outfalls

Group A Outfalls exceeded both screening criteria and modified bylaw limits. In order to be placed in Group A, a minimum of four samplings (screening plus intensive) was necessary. It was felt that the above gave a sufficient definition of any potential problems.

The above classification was carried out on a parameter by parameter basis. Thus, an outfall may be a Group A outfall only for certain parameters and be a Group B outfall for others.

The problems associated with Group A outfalls were felt to be, in general, sufficiently well defined to determine whether future abatement action was required.

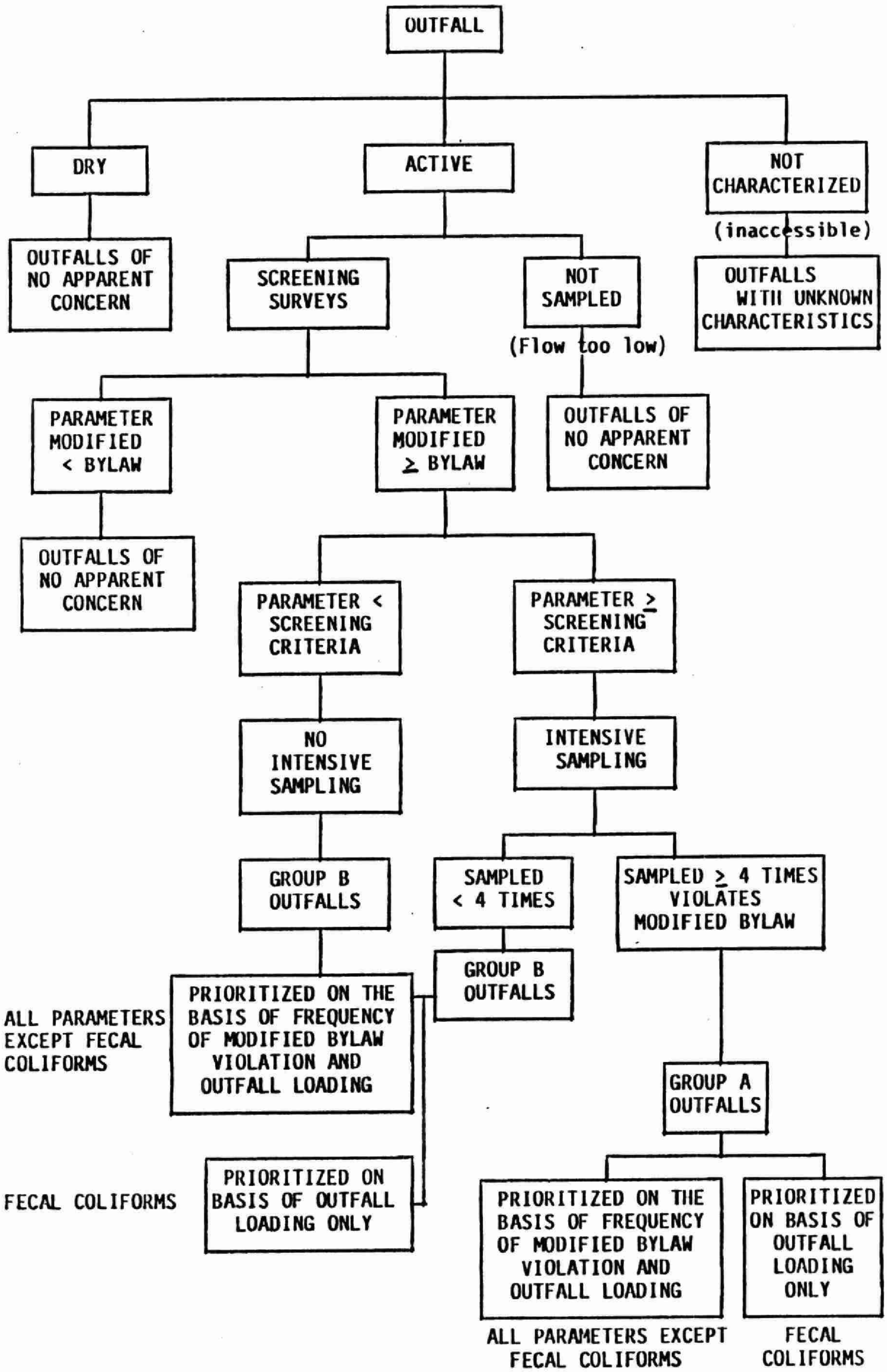

FIGURE 4. SCHEMATIC OF OUTFALL CLASSIFICATION

Group B Outfalls

Group B Outfalls included those in which one or more parameters were greater than the modified bylaw limits, but information was not adequate to fully define typical outfall quality (i.e. less than 4 samples). For the most part, these outfalls were initially of less concern than those in Group A (i.e. parameters < screening criteria). Group B outfalls were also classified by parameter.

In general, Group B outfalls would require further outfall sampling prior to initiating abatement actions.

Outfalls of No Apparent Concern

Outfalls deemed to be of no apparent concern included those outfalls which were dry or non-active and those which had at no time during the survey an analytical parameter greater than the bylaw. In addition, active outfalls in which flows were too low to permit sampling were somewhat arbitrarily categorized as being of no apparent concern.

Outfalls with Unknown Characteristics

Outfalls which could not be surveyed due to inaccessibility (e.g. submerged) were placed in this final category.

It is suggested that where evidence exists that these outfalls may possess significant inputs (e.g. based on in-stream observations) that appropriate efforts be mounted to characterize flows.

5.0 RESULTS AND DISCUSSION

A printout of the complete Mimico Creek data base is provided in a separate volume in Appendix VII. In addition, in order to facilitate location of outfalls, copies of all field data sheets and outfall photographs have been provided in Appendices VI and VIII, respectively. Both appendices are also provided in separate volumes.

5.1 Timetable of Survey Activities

A summary of the project timetable is provided in Figure 5. City of Etobicoke staff conducted the majority of the field work. The late initiation of field activities necessitated assistance from CANVIRO staff in the upper reaches during the screening runs and also precluded completion of the intensive survey. Intensive sampling of several outfalls which were selected based on second screening run data was not completed.

5.2 Outfall Inventory

A summary of the outfall inventory by reach and flow status is provided in Table 6. A total of 194 outfalls were inventoried. With the exception of 3 dry ditches all other outfalls were storm sewers. Eighty-seven outfalls or 45% of all storm outlets contained some flow and were accordingly categorized as active (although all could not necessarily be sampled because of low flows).

The geographic distribution of outfalls was uneven with 51% located in the three reaches (MA, MB, MC) nearest to the mouth of the creek (see Figure 2).

Outfall locations are presented in the reach maps provided in Appendix I.

5.3 Sampling Summary

A summary of the outfalls sampled for water quality parameters is provided in Table 7. Of the active outfalls, 83% were sampled at least once and 69% were sampled at least twice. Outfalls that were active but not sampled had for the most part insufficient flow. None of the submerged outfalls were sampled at upstream manholes due to manpower limitations.

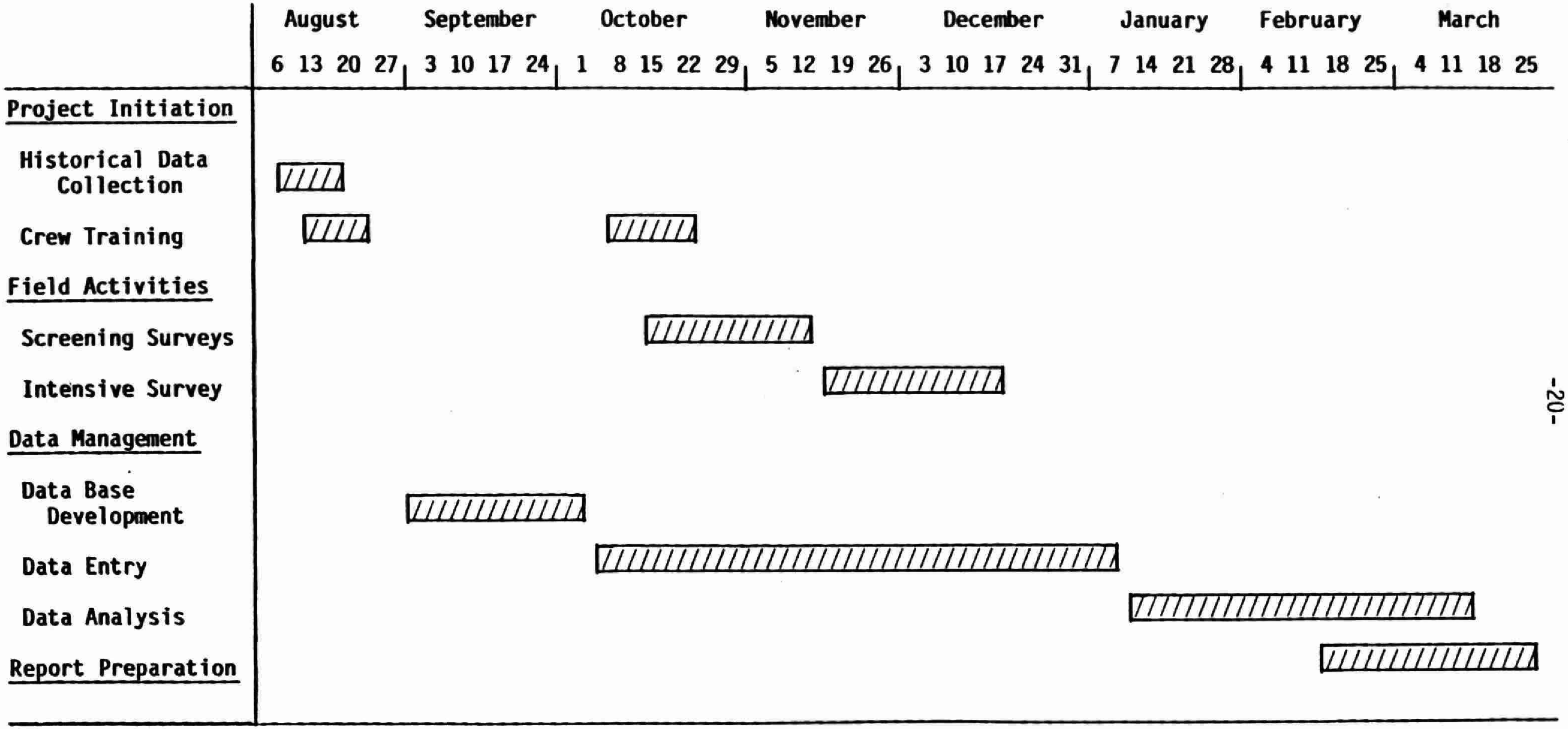

FIGURE 5. TIMETABLE OF SURVEY ACTIVITIES

TABLE 6. SUMMARY OF OUTFALL INVENTORY

REACH	FLOWING STORM SEWERS	DRY STORM SEWERS	SUBMERGED STORM SEWER	FLOWING DITCHES	DRY DITCHES	TOTAL
MA	16	13	0	0	1	30
MB	13	24	1	0	0	38
MC	15	15	0	0	0	30
MD	7	5	2	0	0	14
ME	3	5	2	0	0	10
MF	6	6	2	0	0	14
MG	12	11	0	0	2	25
MH	9	6	0	0	0	15
MI	6	12	0	0	0	18
TOTAL	87	97	7	0	3	194
	TOTAL STORM SEWERS = 191			TOTAL DITCHES = 3		

TABLE 7. SUMMARY OF OUTFALL SAMPLING

REACH	SCREENING SURVEYS			INTENSIVE SURVEYS
	STORM SEWERS			STORM SEWERS
	Once	Twice	Total	
MA	3	7	10	5
MB	2	10	12	7
MC	1	12	13	6
MD	0	7	7	2
ME	1	0	1	0
MF	0	2	2	1
MG	2	10	12	8
MH	3	6	9	3
MI	0	6	6	0
TOTAL	12	60	72	32

Note: No flowing ditches were observed, hence this categorey is not included in the above summary.

Thirty-two outfalls or 44% of all those sampled during the screening surveys were selected for intensive sampling.

5.4 Outfall Discharge Volumes

A summary of average outfall discharge volumes into each reach, observed over the course of the study is presented in Table 8. Reaches MH and MA, (containing 25 or 29% of flowing storm outfalls) in combination contributed 50% of the total outfall discharge volume. Interestingly, both reaches are adjacent to industrial areas. Etobicoke Works Department, however, reports that no cooling water or industrial effluent discharges are known to exist in these reaches. In contrast, only 5.2 L/sec or approximately 5% of the total outfall discharge entered in Reaches MD and MF which are adjacent to residential areas.

Outfalls MH 536, MB 59 and MA 23 were the three largest flow contributors to the creek, discharging 17%, 11% and 9%, respectively.

TABLE 8. SUMMARY OF TOTAL AVERAGE OUTFALL DISCHARGE INTO EACH REACH

REACH	AVERAGE DISCHARGE (L/sec)
MA	22.3
MB	16.7
MC	8.6
MD	3.7
ME	0.7
MF	0.8
MG	13.3
MH	30.7
MI	7.6
TOTAL DISCHARGE	104.4

5.5 Quality Assurance

As previously noted, quality assurance measurements were based chiefly on Don River sampling.

5.5.1 Variance Attributable to Sampling

Based on regression analysis, the majority of parameters showed no significant differences attributable to sampling (i.e. $r > 0.95$) in replicated data. Exceptions were total phosphorus ($r = 0.81$), iron ($r = 0.93$) and lead ($r = 0.93$). Detailed results of the regression analyses and the resulting regression equations are presented in Appendix IV.

5.5.2 Analytical Differences Between Laboratories

Linear regressions of the replicated analytical data from the two laboratories (MOE and IEC Beak) for the conventional and metal parameters are also provided in Appendix IV. Based upon the regression analysis, significant differences (correlation coefficient $r < 0.95$) in replicated data were observed for all parameters except SS and chromium. Specific reasons for this are not apparent at this time; however, the differences in procedures and detection limits between the two laboratories should be recognized.

5.5.3 Microbiological QA

The results of the one-way Analysis of Variance conducted for fecal coliform and fecal streptococcus parameters are provided in Appendix IV. No significant difference was determined between the two laboratories in the analysis of replicated data for any parameter.

5.6 Average Outfall Discharge Quality

The flow weighted concentrations of outfall discharge quality averaged by reach and for the entire creek are provided in Tables 9 (fecal bacteria), 10 (conventional and phenolics) and 11 (metals). The flow weighted concentration of each parameter for each outfall is provided in Appendix VII.

Data specifying pH values are not presented in the text since no pH violations were observed. pH values for individual outfalls can be found in Appendix VII.

TABLE 9. SUMMARY OF OUTFALL AVERAGE FLOW WEIGHTED DISCHARGE DENSITY OF FECAL BACTERIA

REACH	FECAL COLIFORM (org/100 mL)	FECAL STREPTOCOCCUS (org/100 mL)
MA	7.81×10^3	1.07×10^4
MB	4.15×10^3	3.14×10^3
MC	5.58×10^3	8.19×10^2
MD	2.87×10^3	1.79×10^3
ME	2.11×10^3	1.76×10^4
MF	1.25×10^3	1.16×10^3
MG	5.50×10^4	1.10×10^4
MH	4.10×10^3	1.59×10^3
MI	2.77×10^3	1.67×10^3
OVERALL AVERAGE	1.14×10^4	4.75×10^3

TABLE 10. SUMMARY OF OUTFALL AVERAGE FLOW WEIGHTED CONCENTRATIONS FOR CONVENTIONAL PARAMETERS AND PHENOLS

REACH	BOD (mg/L)	TOTAL P (mg/L)	SS (mg/L)	TKN (as N) (mg/L)	PHENOLS (μg/L)
MA	31.4	2.19	17.6	1.45	3.20
MB	5.3	0.13	6.67	0.58	2.85
MC	0.5	0.08	27.27	0.33	0
MD	0.5	0.11	2.63	0.21	0
ME	24.7	1.60	10.62	0.91	0
MF	0.4	0.24	1.16	0.26	1.5
MG	35.6	0.47	16.12	1.57	6.89
MH	3.2	0.17	12.14	1.06	0
MI	2.7	0.04	3.08	4.59	1.31
OVERALL AVERAGE	12.20	0.69	12.90	1.21	4.58

TABLE 11. SUMMARY OF AVERAGE OUTFALL FLOW WEIGHTED CONCENTRATIONS FOR METALS

REACH	LEAD (mg/L)	ZINC (mg/L)	COPPER (mg/L)	CHROMIUM (mg/L)	IRON (mg/L)
MA	0.07	0.21	0.03	0.11	0.72
MB	0.05	0.03	0.01	0.01	1.14
MC	0.07	0.03	0.01	0.02	0.35
MD	0.09	0.02	0.01	0.02	0.61
ME	0.09	0.02	0.02	0.02	0.49
MF	0.08	0.03	<0.01	0.01	0.10
MG	0.07	0.07	0.02	0.02	0.44
MH	0.03	0.07	0.01	0.02	0.33
MI	0.06	0.03	0.01	0.02	1.07
AVERAGE	0.05	0.08	0.02	0.05	0.71

Average flow weighted discharge densities of fecal coliform bacteria ranged from 1.25×10^3 org/100 mL in Reach MF to 5.50×10^4 org/100 mL in Reach MG. Fecal streptococcus densities were also high and in some cases, as in Reaches MA and ME, were higher than fecal coliform densities.

Average BOD and suspended solids concentrations were above modified bylaw limits in Reaches MA and MG both of which are adjacent to industrial areas. In addition, average BOD concentrations in Reach ME and suspended solids concentrations in Reach MC (combined residential, industrial and commercial land-use) were above modified bylaw limits. Only Reaches MA and ME had concentrations of total phosphourus above the modified bylaw limit. Average phenol concentrations were below modified bylaw limits in all cases. TKN concentrations were well below the criteria developed for this project in all reaches.

Only Reaches MB and MI had average concentrations of iron above modified bylaw limits . Otherwise, metal concentrations were well within modified bylaw criteria.

5.7 Outfall Pollutant Loadings

A summary of average loadings for each water quality parameter summed by reach and for the entire river is provided in Tables 12 (bacteriological), 13 (conventional and phenolics) and 14 (metals). The average load of each parameter for each outfall is provided in Appendix VII.

TABLE 12. SUMMARY OF AVERAGE OUTFALL LOADINGS OF FECAL BACTERIA

REACH	FECAL COLIFORM (org/sec)	FECAL STREPTOCOCCUS (org/sec)
MA	1.7×10^6	2.4×10^6
MB	6.9×10^5	5.2×10^5
MC	4.8×10^5	7.0×10^4
MD	1.1×10^5	6.6×10^4
ME	1.5×10^4	1.2×10^5
MF	1.0×10^3	9.3×10^3
MG	7.3×10^6	1.5×10^6
MH	1.3×10^6	4.9×10^5
MI	2.1×10^5	1.3×10^5
TOTAL LOADING	1.2×10^7	5.3×10^6

TABLE 13. SUMMARY OF OUTFALL AVERAGE LOADINGS FOR CONVENTIONAL PARAMETERS AND PHENOLS

REACH	BOD (gm/day)	TOTAL P (gm/day)	SS (gm/day)	TKN (as N) (gm/day)	PHENOLS (gm/day)
MA	60,499	4,220	33,910	2,794	6.2
MB	7,647	188	9,624	873	4.1
MC	372	59	20,263	245	0.0
MD	160	35	841	67	0.0
ME	1,494	97	642	55	0.0
MF	28	17	80	18	0.1
MG	40,909	540	18,524	1,804	7.9
MH	8,488	451	32,201	2,812	0.0
MI	1,723	26	2,022	3,013	0.9
TOTAL LOADING	121,360	5,632	118,108	11,646	19.2

TABLE 14. SUMMARY OF OUTFALL AVERAGE LOADINGS FOR HEAVY METALS

REACH	LEAD (gm/day)	ZINC (gm/day)	COPPER (gm/day)	CHROMIUM (gm/day)	IRON (gm/day)
MA	135	405	58	212	1,387
MB	72	43	14	14	1,645
MC	52	22	7.4	15	260
MD	29	6.4	3.2	6.4	195
ME	5.4	1.2	1.2	1.2	30
MF	5.5	2.1	0.7	0.7	6.9
MG	80	80	23	23	506
MH	80	186	27	53	875
MI	39	20	6.6	13	703
TOTAL LOADING	498	766	141	339	5,607

Bacteria

Total bacterial loads of 1.2 x 10^7 org/sec fecal coliform and 5.3 x 10^6 org/sec fecal streptococcus were measured entering Mimico Creek. Loadings of bacteria into Mimico Creek were highest in Reaches MG, MA and MH (61%, 14% and 11% of fecal coliform loads and 28%, 45% and 29% of fecal streptococcus, respectively). Individual outfalls contributing significant loadings included MG 519, 517 and 526 and MA 23 which in sum accounted for 49% of the fecal coliform and 33% of the fecal streptococcus loads.

BOD

The total load of BOD into Mimico Creek was measured to be 121,360 gm/day. Significant individual outfalls contributing BOD loads included MG 509, MA 19 and MA 23 which collectively accounted for 66% of the total load into the river. Of the above, only Outfall MA 23 exceeded modified bylaw limits on one occasion.

Total Phosphorus

The total phosphorus load into the creek was measured as 5632 gm/day. The average load from outfall MA 23 accounted for 70% of the total input into the river. This outfall violated phosphorus limits on 4 of 6 visits.

Suspended Solids

The measured total suspended solids loading to Mimico Creek was found to be 118,108 gm/day. The bulk of the loading (~ 99%) originated from Reaches MA to MC and MG to MH. Outfalls MA 23 and MH 531 contributed the highest individual loadings (16% and 12% of the total, respectively) of outfalls with concentrations in excess of modified bylaw limits. Outfall MH 536 accounted for 23% of the total load although it did not violate modified bylaw limits.

TKN

The total load of TKN into the Creek was estimated to be 11,646 gm/day. As with suspended solids, loads of TKN were dispersed among the lower and upper reaches. Outfalls MH 536 (28%) and MA 23 (12%) were the largest individual load contributors to the creek. Neither exceeded the criteria.

Phenolics

The total input of phenols to Mimico Creek was 19.2 gm/day. Three outfalls accounted for the majority of the phenol loads; MG 517 (29%), MB 59 (26%) and MG 519 (21%). Only MG 517 was above modified bylaw limits on any occasion (once).

Lead and Copper

Total loads of lead and copper into the river were 498 and 141 gm/day, respectively. In both cases, Reach MA was the major contributor. Outfall MA 23 was the major contributor of both metals (21% for lead, 23% for copper).

Zinc and Chromium

Zinc and chromium loads into Mimico Creek were 766 gm/day and 339 gm/day, respectively. Outfall MA 23 accounted for 45% of the zinc and 57% of the chromium load of the entire river. This outfall also violated modified bylaw limits on 1 occasion for both parameters.

Iron

The total contribution of iron into the river from all outfalls was 5607 gm/day. Reaches MA (23%), MB (28%) and MH (21%) contributed the majority of the iron load. Outfalls MB 45 (20%), MA 23 (16%) and MH 536 (11%) were the highest contributors to the total load. Outfall MB 45 violated modified bylaw limits 3 of 6 visits.

5.8 Outfall Classification

5.8.1 Outfalls Exceeding Modified Bylaw Limits

The total number of outfalls which exceeded modified bylaw limits for each parameter are summarized in Table 15. Fecal coliform bacteria was the most common violation observed (22% of sampled outfalls). Iron and BOD parameters were the next most common bylaw violations (24% and 22% of sampled outfalls, respectively). No modified bylaw violations for copper or lead were recorded.

TABLE 15. SUMMARY OF THE NUMBER OF OUTFALLS EXCEEDING MODIFIED BYLAW LIMITS FOR EACH PARAMETER

PARAMETER	NUMBER OF OUTFALLS
Fecal Coliform	16
BOD	16
TKN	4
Total Phosphorus	7
Suspended Solids	15
Lead	0
Zinc	1
Copper	0
Chromium	1
Iron	18
Phenols	4

5.8.2 Group A Outfalls

Table 16 summarizes the Group A outfalls and lists, where applicable, the frequency of violation for each parameter. This Table provides a method of ranking outfalls violating multiple modified bylaw criteria. Based on this system, outfalls MG 509 and MA 23 had the highest number of violations, 16 and 10, respectively.

An additional method of ranking outfalls of concern is provided in Appendix V. Outfalls are ranked for all parameters but fecal coliforms by the number of observations above modified bylaw limits and for all parameters by the average discharge loading.

5.8.3 Group B Outfalls

A summary of Group B outfalls and where applicable, the number of violations above the modified bylaw limits are presented in Table 17. This Table also prioritizes outfalls based on multiple parameter violations. Outfalls in Reach MI (552, 554, 556, 566 and 570) and MH 531 all violated modified bylaw criteria on multiple occassions. Group B outfalls are also ranked for all parameters but fecal coliforms by the number of violations and for all parameters by the average loading for each parameter. This alternate Group B rankings are presented in Appendix V.

TABLE 16. SUMMARY OF THE NUMBER OF VIOLATIONS ABOVE MODIFIED BYLAW LIMITS FOR GROUP A OUTFALLS

NUMBER	FC	BOD	TKN	TOTAL P	SS	LEAD	ZINC	COPPER	CHROMIUM	IRON	PHENOLS
MA 15					1	0	0	0	0	1	
17	X										
(*)18		1		0	2	0	0	0	0	2	
23	X	1		4	1	0	1	0	1	1	
MB 34	X					0	0	0	0	6	
(*)51						0	0	0	0	6	
53		0		4	0						
59	X	1									
61	X	3		0	0						
67	X										
MC(*)52	X										
62	X										
91	X										
103											
105					1	0	0	0	0	1	
MD 78											
127	X										
MG 502											
509	X	5		2	6	0	0	0	0	2	
511	X										
514	X										
(*)517	X	3		1	2						
524	X										
526	X	2		1	2						
MH 532	X										
536	X										

Notes: * = Also in Group B

All parameters sampled intensively are listed. Parameters left blank were not sampled intensively.

The letter X in the FC column indicates violation of modified bylaw limits based upon the average of at least four occasions.

TABLE 17. SUMMARY OF NUMBER OF VIOLATIONS ABOVE MODIFIED BYLAW LIMITS FOR GROUP B OUTFALLS

NUMBER	FC	BOD	TKN	TOTAL P	SS	LEAD	ZINC	COPPER	CHROMIUM	IRON	PHENOLS
MA 8					2						
18	X										
19	X	3		1	1						
21		2								2	
MB 43										1	
51		1									
45						0	0	0	0	3	
MC 52					1						
MD 88	X									1	
ME 133	X	1		1							
137					1					1	
MG 517											1
519	X	1									
MH 529	X										
531	X	1			3					1	
544	X										
MI 552		2	2		2					2	2
554		1	2		2					2	1
556		1	2		2					2	2
566			1							3	
570	X									3	
541	X										

Notes: * = Also in Group B

All parameters sampled intensively are listed. Parameters left blank were not sampled intensively.

The letter X in the FC column indicates violation of modified bylaw limits based upon the average of at least four occasions.

5.8.4 Outfalls with Unknown Effluent Characteristics

A number of outfalls were submerged (7) preventing sampling of the effluent. An attempt should be made to sample these outfalls at the first manhole upstream from the creek and not affected by the creek.

5.8.5 Outfalls with No Apparent Effluent Quality Problem

Outfalls with no apparent effluent quality problem were characterized as active outfalls which at no time were parameters observed to be above bylaw; and those outfalls which were non-active.

6.0 SUMMARY

During the fall of 1984, a dry weather outfall survey was conducted on the sections of Mimico Creek within the boundaries of the City of Etobicoke. A total of 194 outfalls were inventoried, 87 (45%) of which were actively flowing. A total of 72 outfalls were sampled for various water quality parameters during screening runs. Thirty-three of these outfalls, were intensively sampled to obtain further water quality data.

Outfalls were categorized as to the degree of contamination of the effluent and were presented in such a manner as to allow prioritization of the degree of the problem. Outfalls were ranked for all parameters except fecal coliforms by the number of modified bylaw violations and the average loading of each parameter. Outfalls exceeding fecal coliform criteria were ranked by average loading only. Outfalls of concern were grouped into two categories, Group A contained those outfalls which had sufficient information to properly assess an effluent problem, and Group B outfalls where there was information to suggest a potential problem exists but insufficient data was available to assess the extent of the problem. In total, 26 Group A outfalls were identified. Twenty-two outfalls were categorized as Group B of which 4 outfalls were common to Groups A and B.

Several outfalls (e.g. MA 23 and MG 509) were found to be major contributors of the total load of pollutants to the river and in some cases, these were multiple modified bylaw violators.

Recommended steps which may be undertaken to follow up on this survey are as follows:

i) Outfalls in Group A which are consistent contributors of pollutants and are therefore of high priority, should be investigated to locate the source of contamination.

ii) Outfalls in Group B which are listed as high priority should have additional sampling conducted at the outfall to better define the extent of the problem.

iii) Submerged outfalls should be investigated at the first upstream manhole to assess the quality of any flows.

7.0 REFERENCES

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8.0 ACKNOWLEDGEMENTS

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The prompt returns of analytical data and patience in dealing with the large volumes of samples submitted to the MOE laboratories in Rexdale, to IEC Beak and to Young and Associates was greatly appreciated.

We are also grateful for the guidance and support provided by the Ministry of the Environment staff and in particular, Fritz Engler, Brian Greck and Judy MacDonald.

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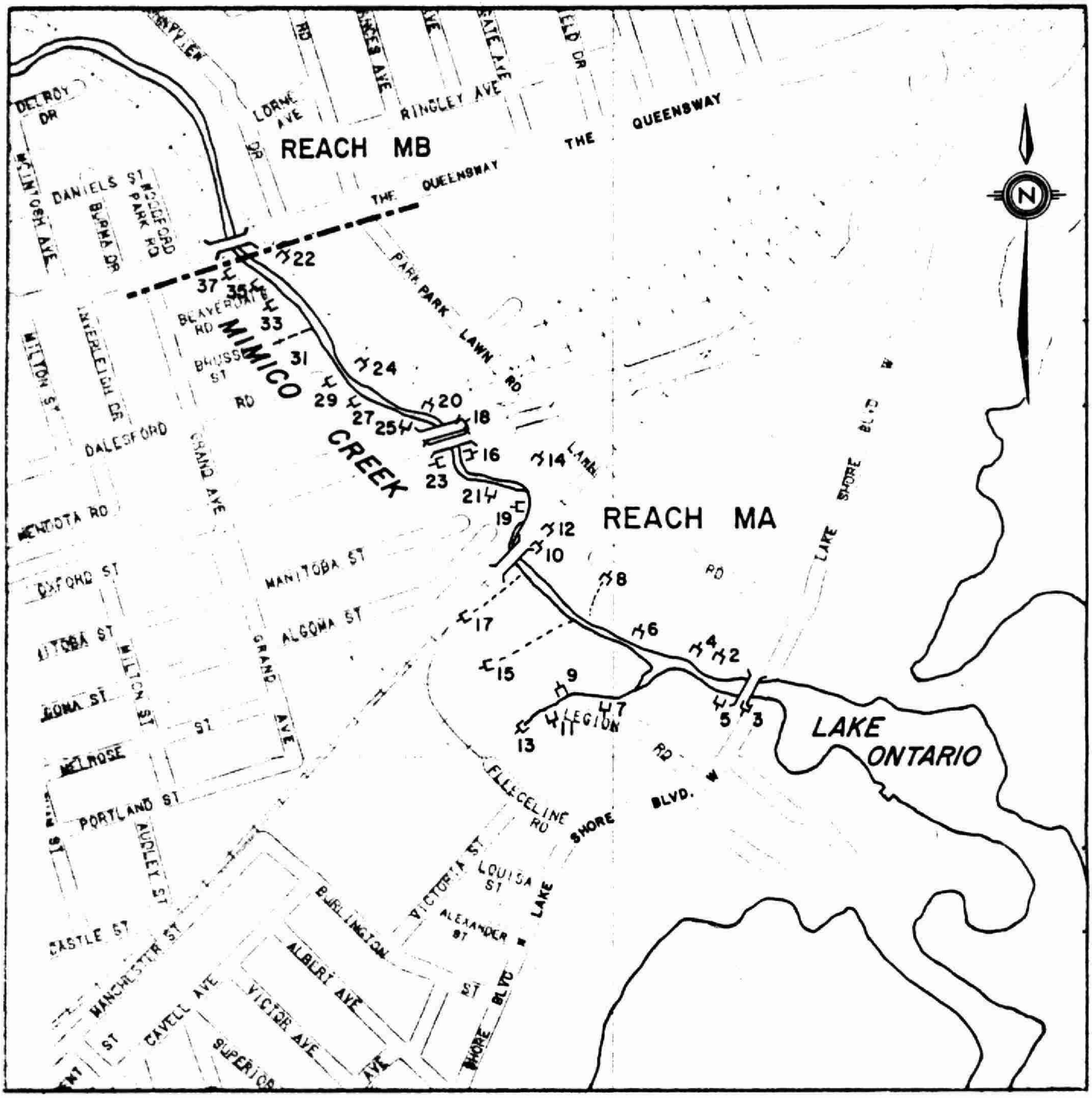
APPENDIX I

MIMICO CREEK
REACH MAPS

APPENDIX I : REACH MAPS ILLUSTRATING OUTFALL LOCATIONS ON MIMICO CREEK

REACH MA



LEGEND

804 OUTFALL LOCATION & IDENTIFICATION

WEIR

BRIDGE

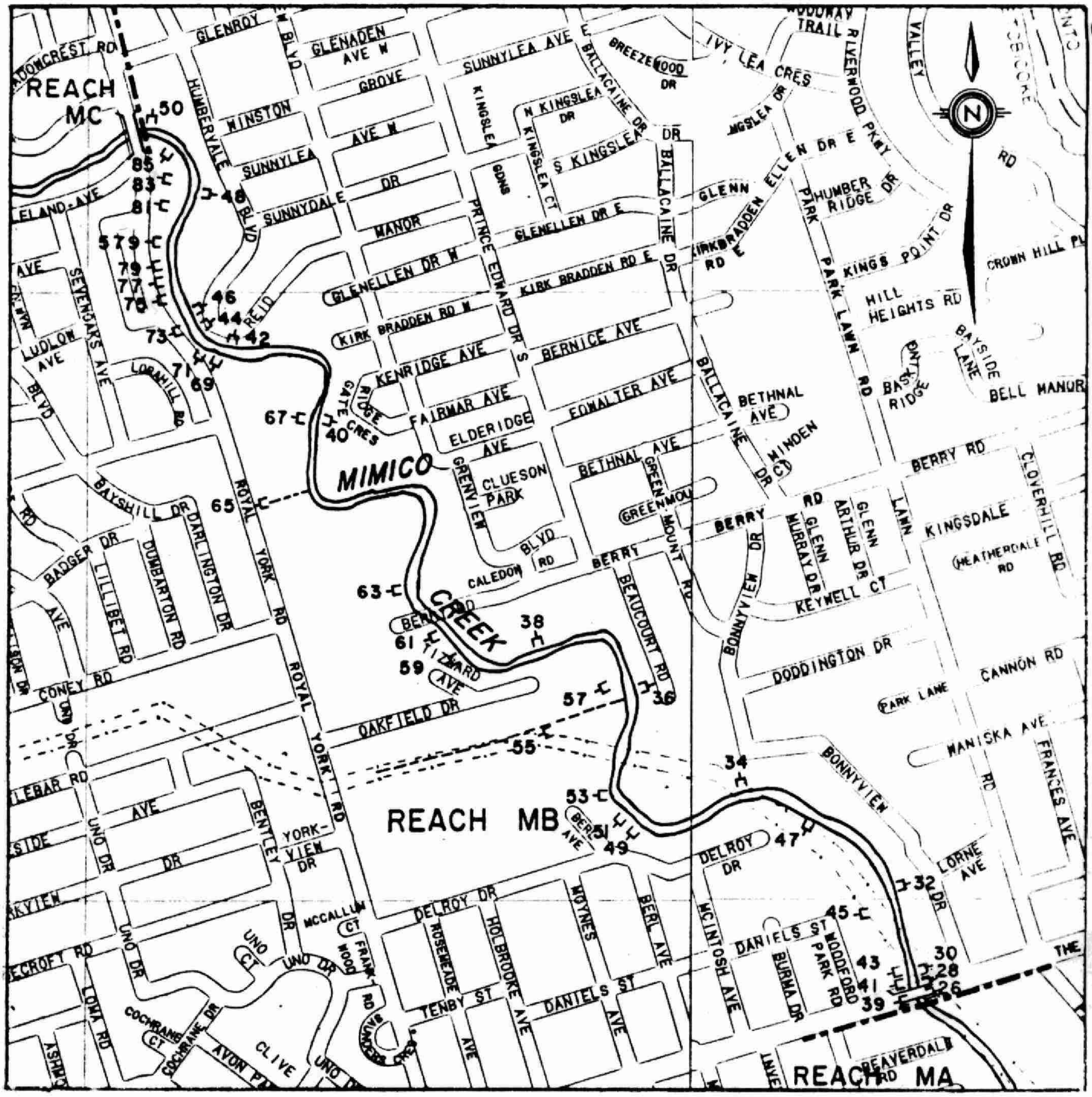
REACH BOUNDARY

SCALE 1:10 000
NOVEMBER, 1984

CANVIRO CONSULTANTS LTD

FIGURE I-1. MIMICO CREEK AND TRIBUTARY DRY WEATHER OUTFALL STUDY

REACH MB



LEGEND

- 804 OUTFALL LOCATION & IDENTIFICATION
- WEIR
- BRIDGE
- REACH BOUNDARY

SCALE 1:10 000
NOVEMBER, 1984

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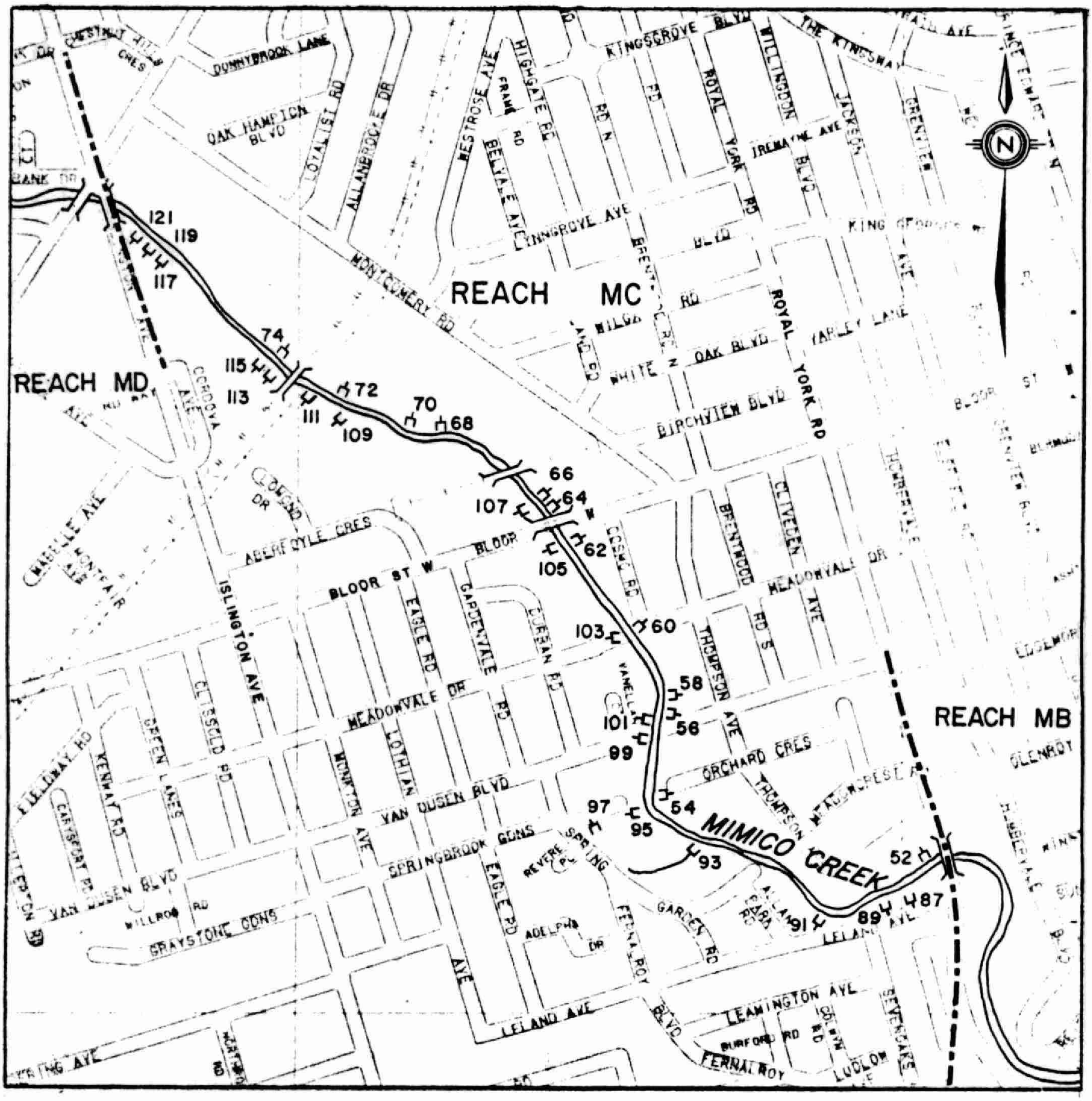
FIGURE I-2. MIMICO CREEK AND TRIBUTARY DRY WEATHER OUTFALL STUDY

REACH MC



LEGEND

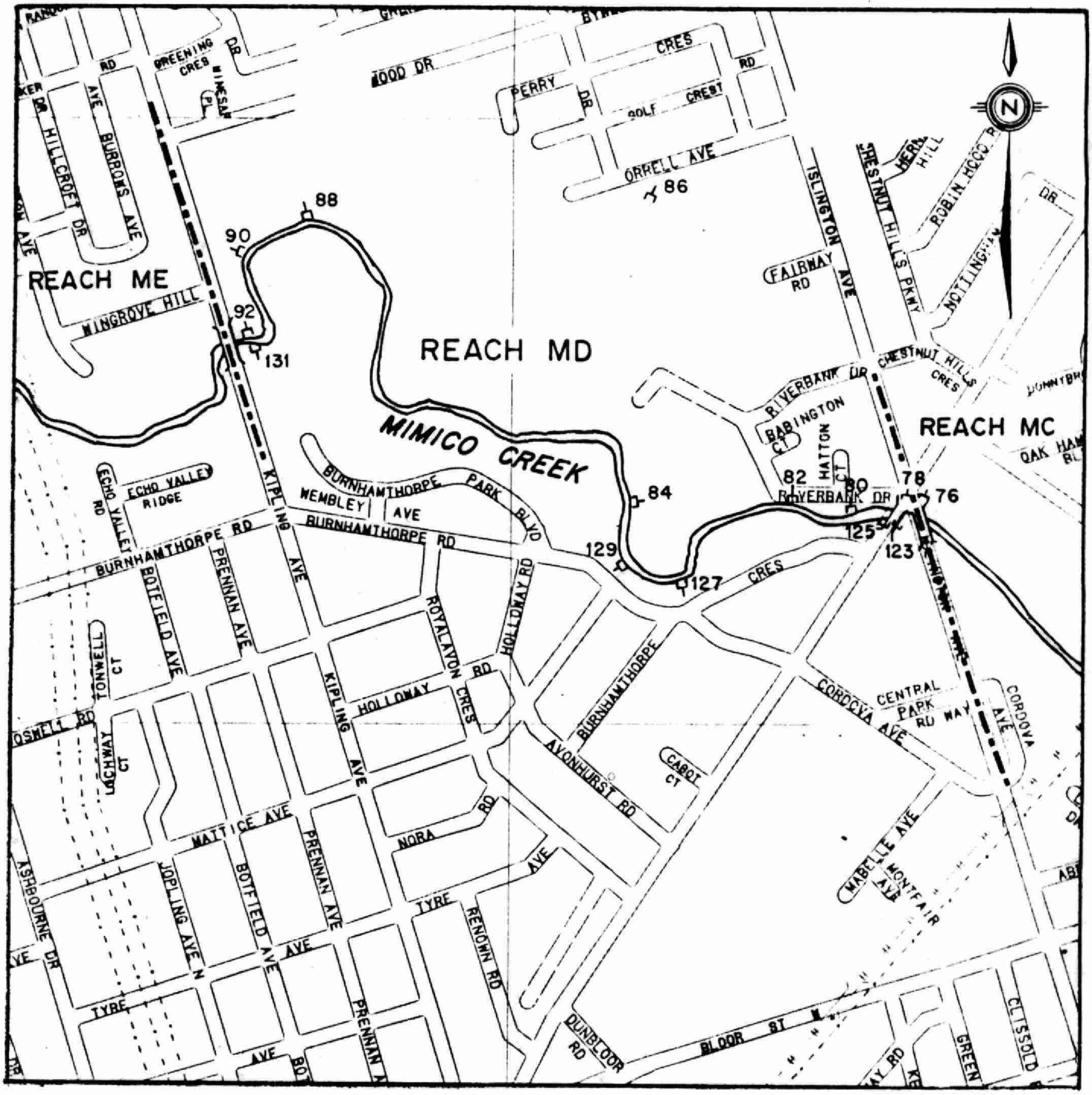
—804	OUTFALL LOCATION & IDENTIFICATION
	WEIR
	BRIDGE
– – –	REACH BOUNDARY

SCALE 1:10 000
NOVEMBER, 1984

CANVIRO CONSULTANTS LTD

FIGURE I-3. MIMICO CREEK AND TRIBUTARY DRY WEATHER OUTFALL STUDY

REACH MD



LEGEND

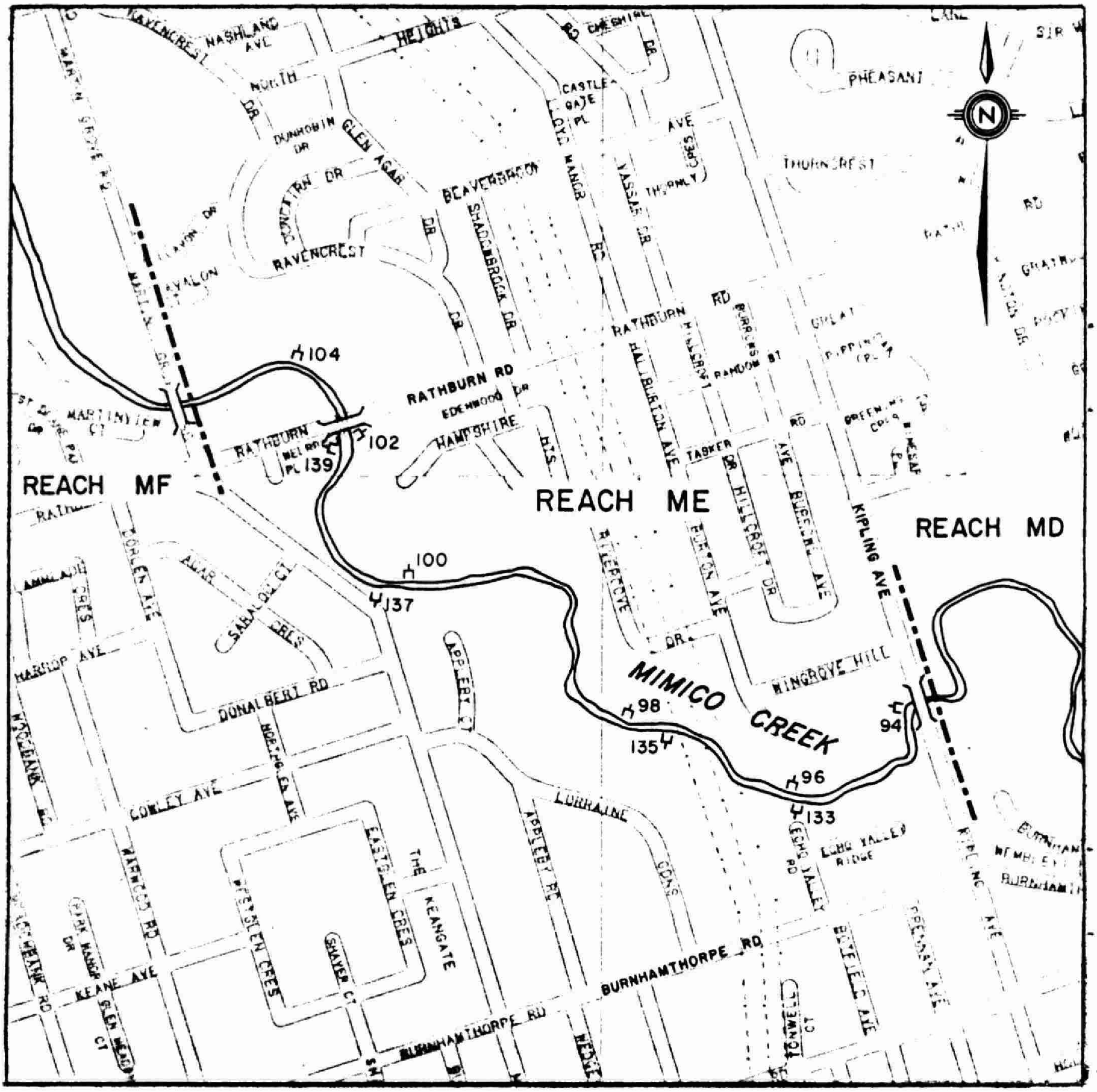
- 804 OUTFALL LOCATION & IDENTIFICATION
- WEIR
- BRIDGE
- REACH BOUNDARY

SCALE 1:10 000
NOVEMBER, 1984

CANVIRO CONSULTANTS LTD

FIGURE I-4. MIMICO CREEK AND TRIBUTARY DRY WEATHER OUTFALL STUDY

REACH ME



L E G E N D

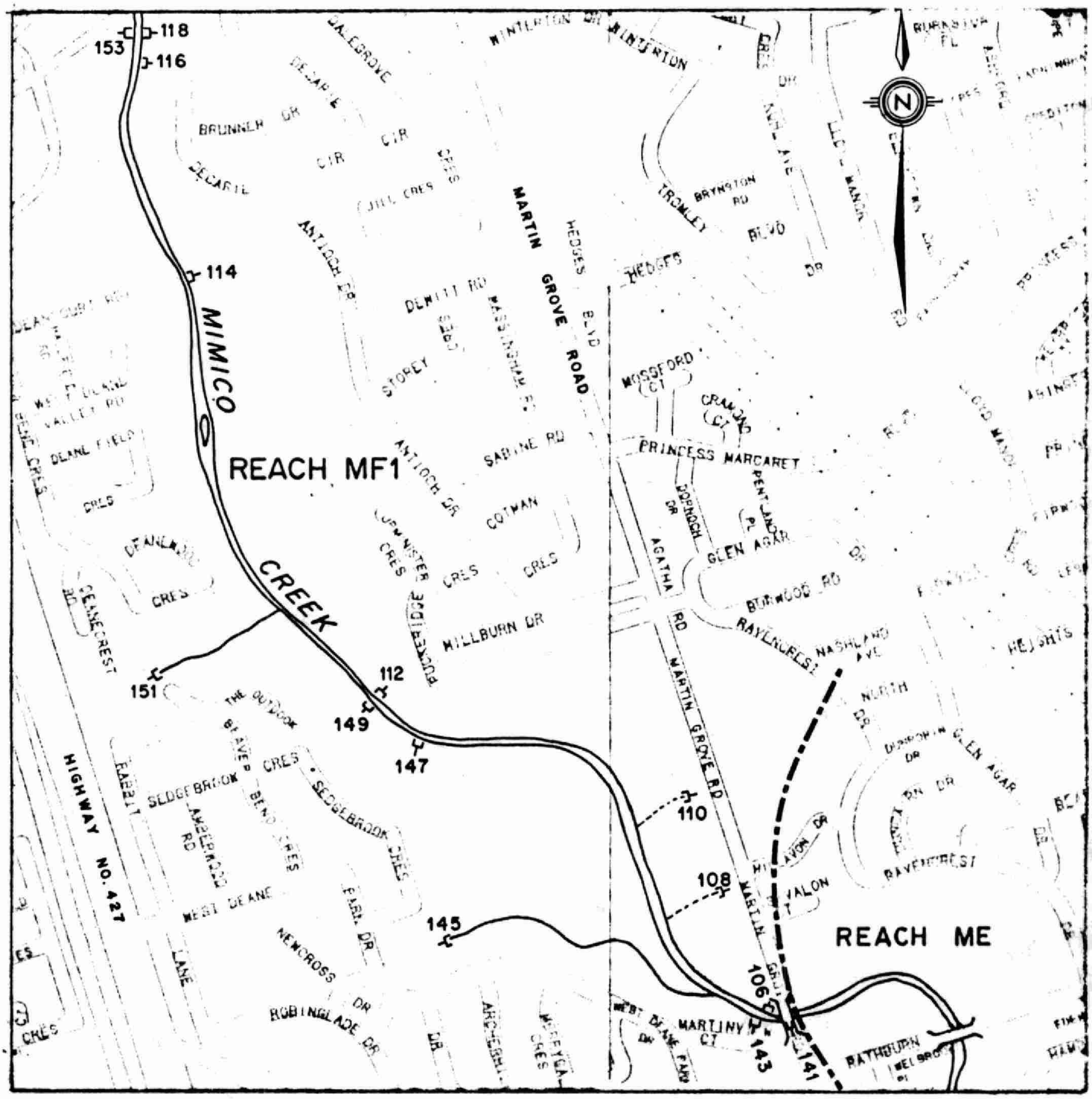
804	OUTFALL LOCATION & IDENTIFICATION
	WEIR
	BRIDGE
	REACH BOUNDARY

SCALE 1:10 000
NOVEMBER, 1984

CANVIRO CONSULTANTS LTD

FIGURE I-5. MIMICO CREEK AND TRIBUTARY DRY WEATHER OUTFALL STUDY

REACH MF1



LEGEND

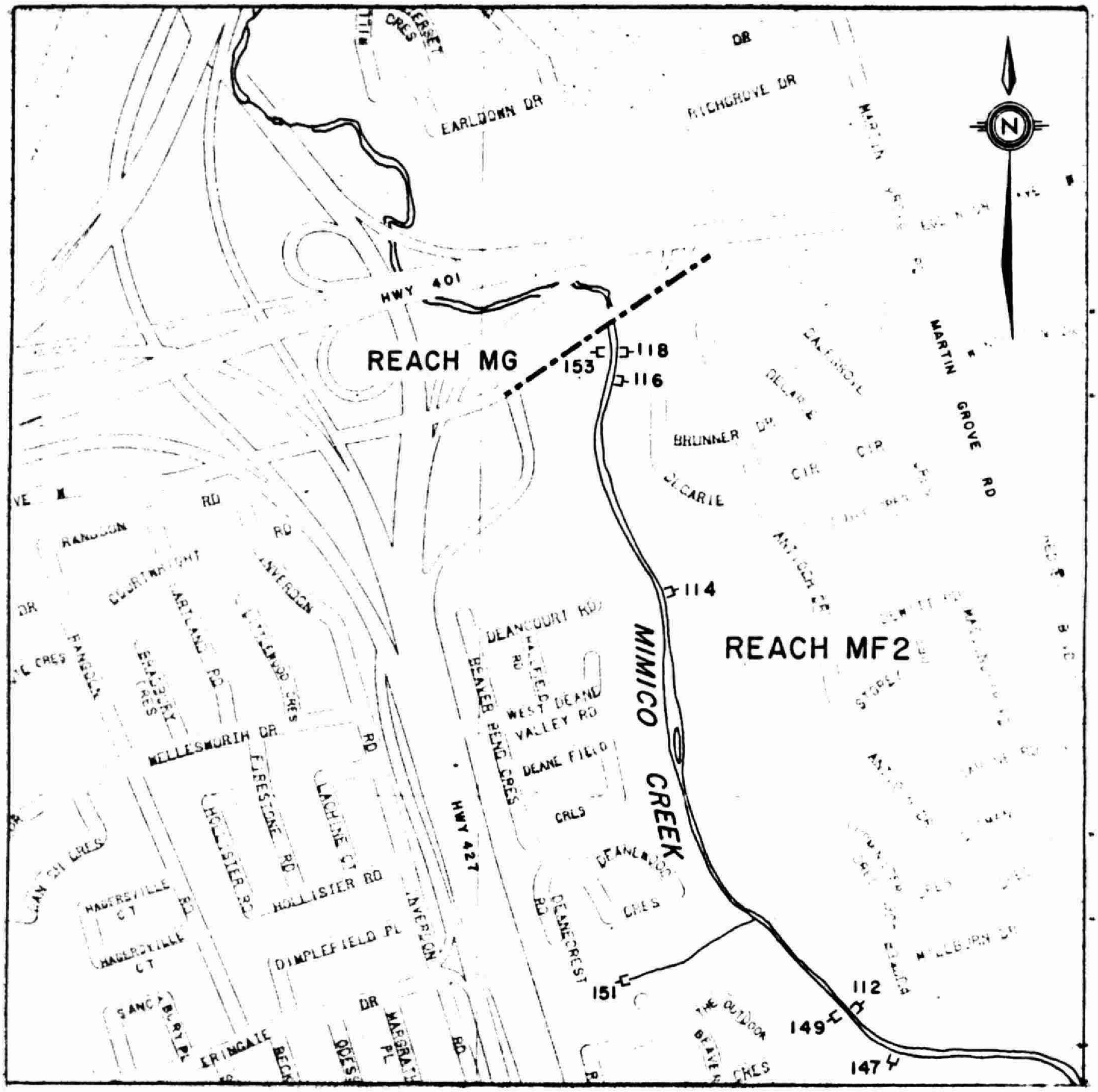
⊐-804	OUTFALL LOCATION & IDENTIFICATION
	WEIR
	BRIDGE
- - -	REACH BOUNDARY

SCALE 1:10 000
NOVEMBER, 1984

CANVIRO CONSULTANTS LTD

FIGURE I-6. MIMICO CREEK AND TRIBUTARY DRY WEATHER OUTFALL STUDY

REACH MF2



LEGEND

804	OUTFALL LOCATION & IDENTIFICATION
	WEIR
	BRIDGE
	REACH BOUNDARY

SCALE 1:10 000
NOVEMBER, 1984

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FIGURE I-7. MIMICO CREEK AND TRIBUTARY DRY WEATHER OUTFALL STUDY

FIGURE I-8. MIMICO CREEK AND TRIBUTARY DRY WEATHER OUTFALL STUDY

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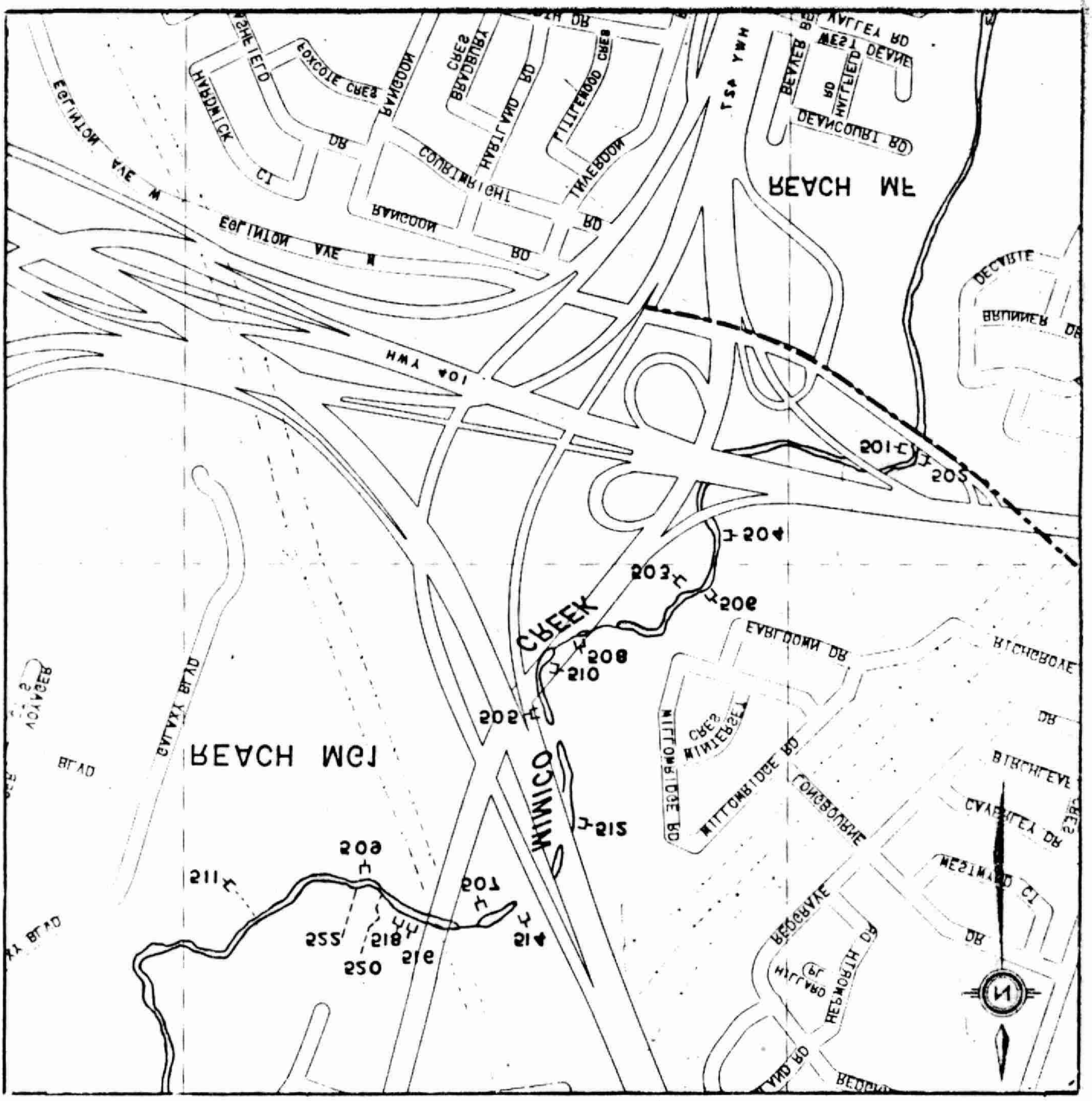
NOVEMBER 1984
SCALE 1:10 000

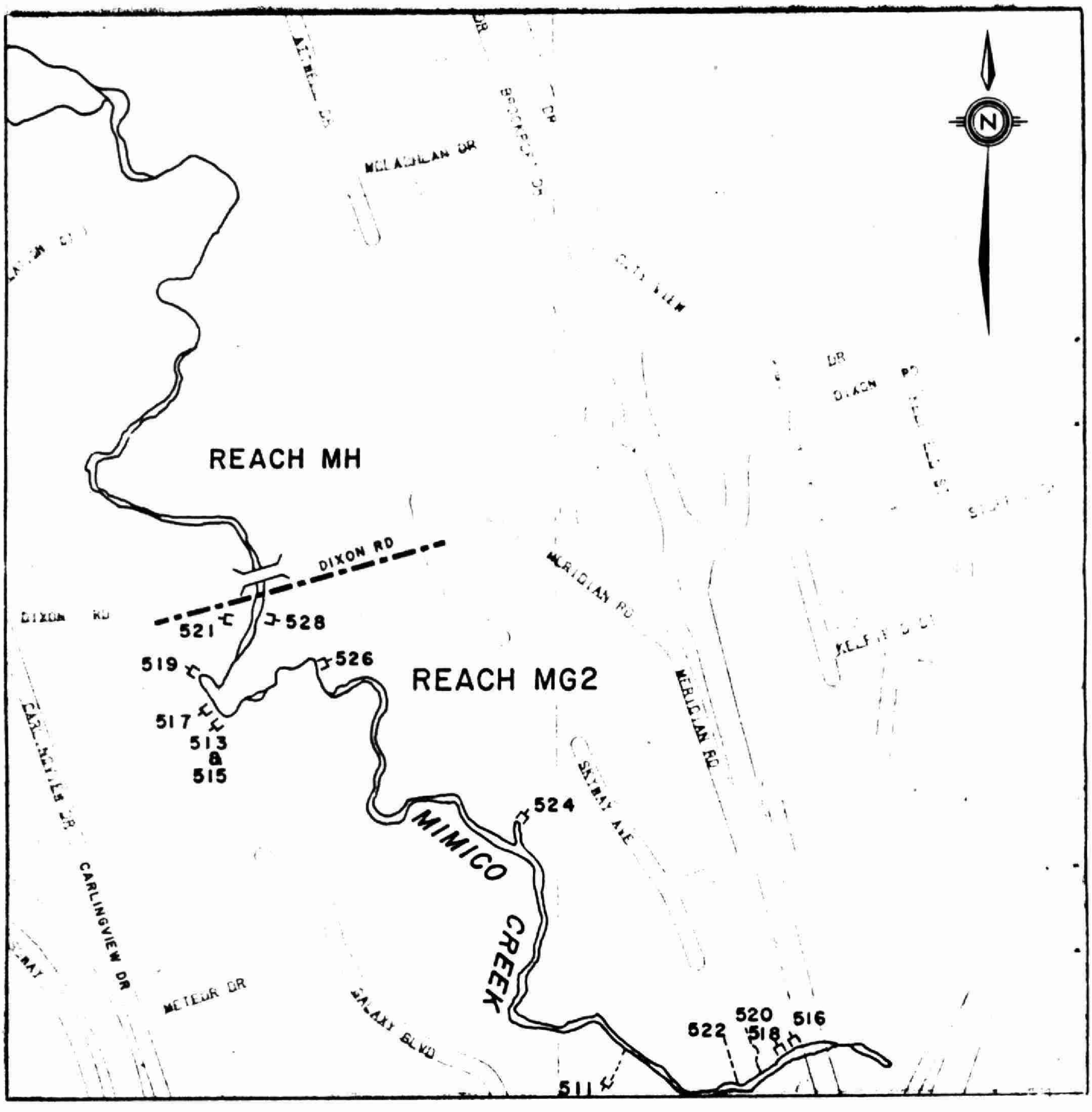
LEGEND

- ⊐—804 OUTFALL LOCATION & IDENTIFICATION
- WEIR
- BRIDGE
- REACH BOUNDARY



REACH MG1

REACH MG2



LEGEND

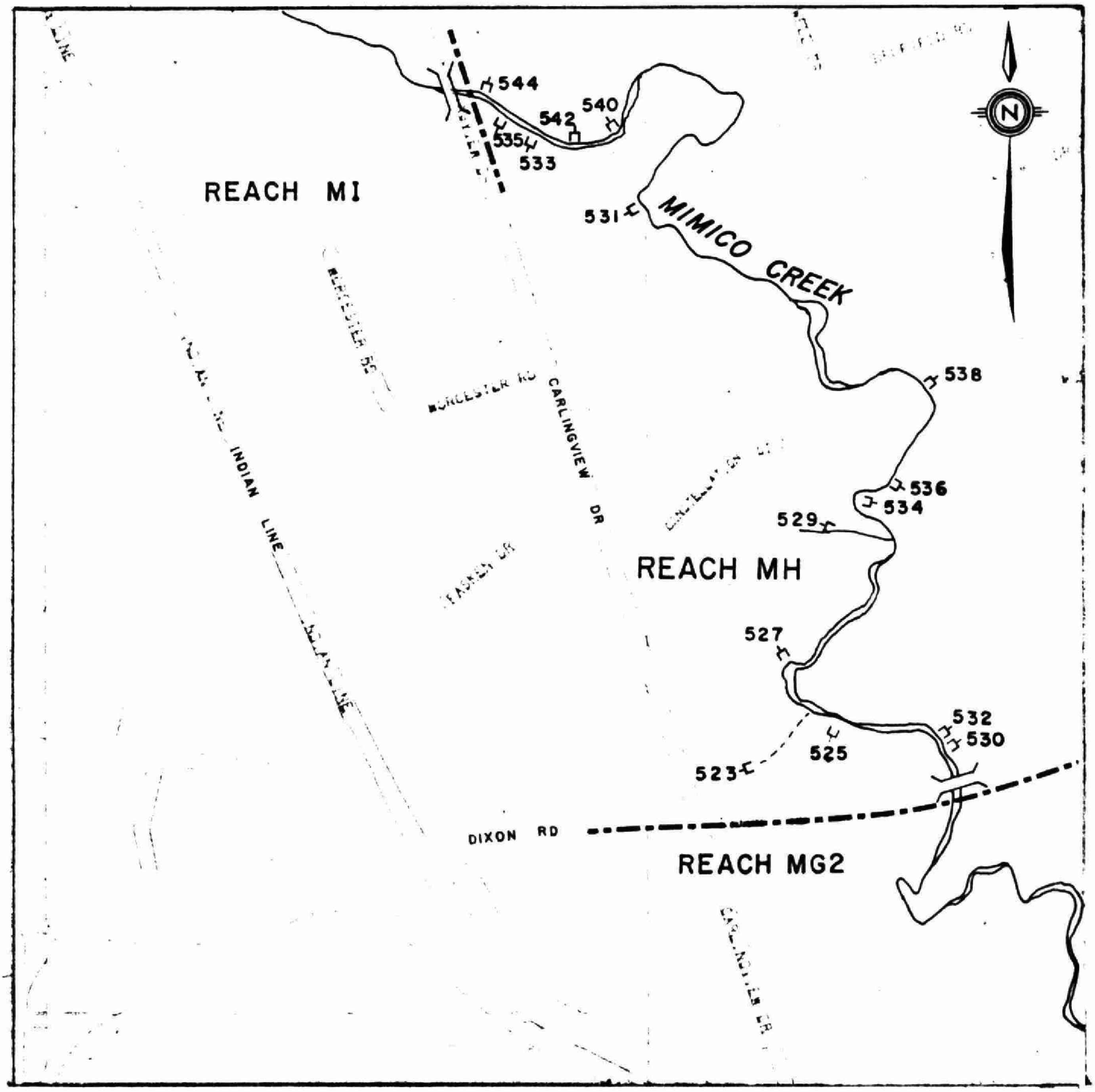
804	OUTFALL LOCATION & IDENTIFICATION
	WEIR
	BRIDGE
	REACH BOUNDARY

SCALE 1:10 000
NOVEMBER, 1984

CANVIRO CONSULTANTS LTD

FIGURE I-9. MIMICO CREEK AND TRIBUTARY DRY WEATHER OUTFALL STUDY

REACH MH



LEGEND

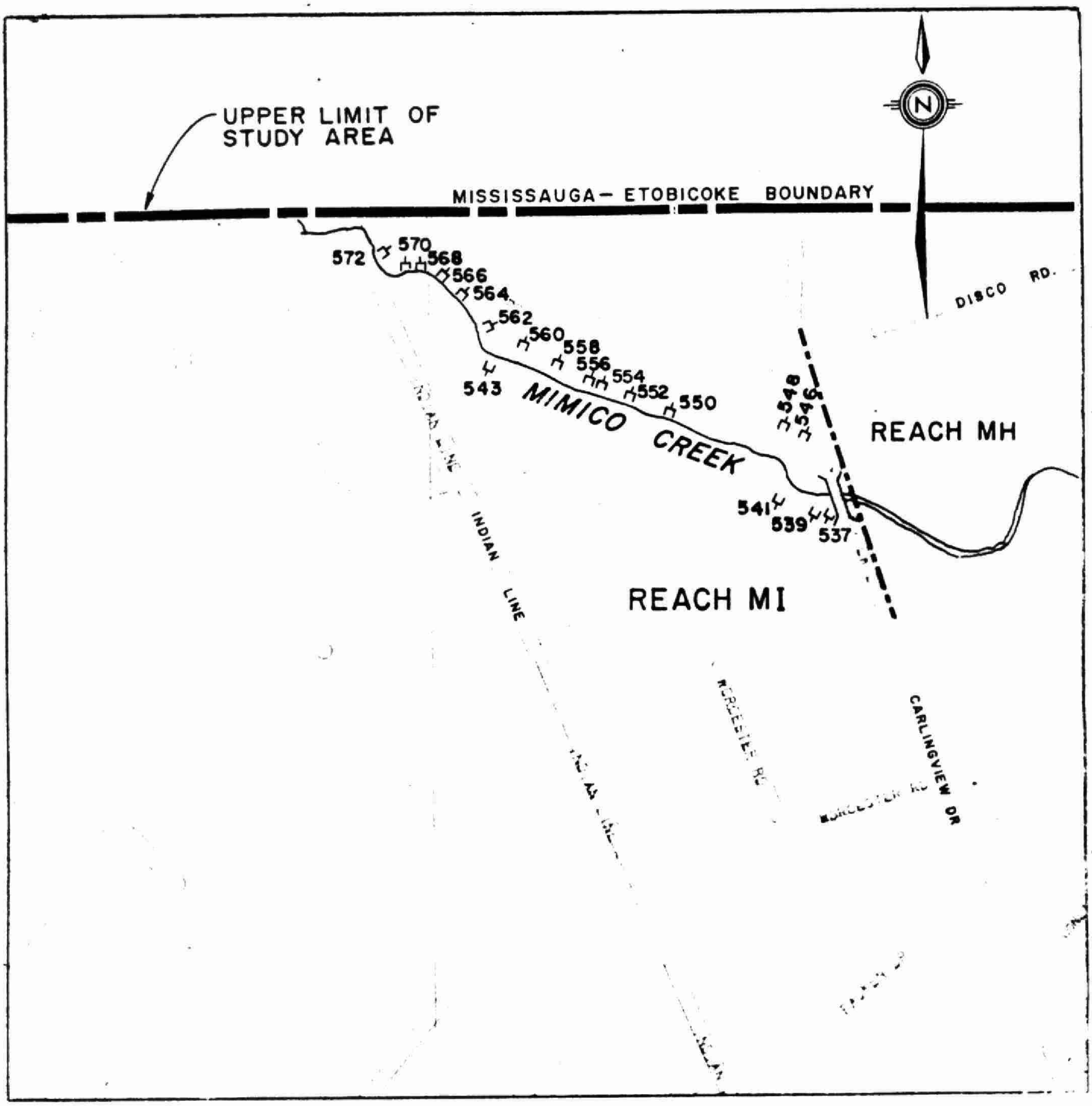
—804	OUTFALL LOCATION & IDENTIFICATION
	WEIR
	BRIDGE
—·—	REACH BOUNDARY

SCALE 1:10 000
NOVEMBER, 1984

CANVIRO CONSULTANTS LTD

FIGURE I-10. MIMICO CREEK AND TRIBUTARY DRY WEATHER OUTFALL STUDY

REACH MI



LEGEND

804	OUTFALL LOCATION & IDENTIFICATION
	WEIR
	BRIDGE
	REACH BOUNDARY

SCALE 1:10 000
NOVEMBER, 1984

CANVIRO CONSULTANTS LTD

FIGURE I-11. MIMICO CREEK AND TRIBUTARY DRY WEATHER OUTFALL STUDY

APPENDIX II

FIELD SHEET AND FIELD EQUIPMENT

1) Sample Field Data Sheet
2) Definition of Field Data Sheet Studies
3) Equipment List

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FIELD DATA SHEET

MIMICO CREEK OUTFALL SURVEY

CREW: ______________________________

DATE: ____________________ TIME: ______________

OUTFALL NUMBER: ______________ MUNICIPAL OUTFALL NUMBER: ______________

STREAM NAME: ______________ REACH: ______________

MUNICIPALITY: ______________________

STREET LOCATION: ______________________________
(Sketch on Back)
____

OUTFALL DESCRIPTION:

SIZE: ____________ SHAPE: ____________ MATERIAL: ____________

MAPPING: ______________ PHOTOGRAPH: ______________

SAMPLES:

CONVENTIONAL ______________

BACTERIA ______________

METALS (HNO_3) ______________

OTHER ______________

LAST PRECIPITATION (Hrs):

OUTFALL FLOW MEASUREMENT:

ON-SITE TESTS:

CONDUCTIVITY (umohs): ______________ pH: ____________

TEMPERATURE: ______________

OBSERVATIONS/COMMENTS:

DESCRIPTION OF FIELD DATA SHEET

Crew: The names and assigned number of the survey crew.

Date: The data that the outfall was visited.

Time: The time that the outfall was visited.

Outfall Number:
The number that was assigned to the outfall upon the first visit.

Municipal Outfall Number:
If applicable any number which a municipality had previously assigned to the particular outfall.

Stream Name:
The given name for the particular section of the river.

Reach: The assigned letter code distinguishing the section or area of the stream.

Municipality:
Etobicoke

Street Location:
The nearest and most relevant streets were listed in this section as well as the compass direction relative to those streets. A sketch was prepared which showed the location of the outfall relative to the river, nearby streets and important structural landmarks.

Outfall Description

Size: The inside dimensions of any man-made outfall measured in inches.

Shape: The outfall configuration was described in this section. The distinctive shapes were given short forms; i.e. circ (circular), rect (rectangular), oval (oval), BH (beehive), HS (horse shoe), semicirc (half a pipe), trib (tributary), ditch (drainage ditch).

Material: The outfall material of construction was described; i.e. CMP (corrugated metal pipe), VC (vitrified clay), STP steel, PV (plastic), BRI (brick), ACT (asbestos-cement), RCO (reinforced concrete).

Mapping: This refers to whether or not the outfall was listed on the 1:2000 field maps or a municipal map; i.e. whether or not the outfall was known to the surveyors prior to finding it.

Photograph: Inficated that the outfall was photographed.

Samples: If samples were taken, a number representing the number of bottles collected was written after the name of each type of sample. If no sample was taken, suitable reasons were provided.

Last Precipitation:
The hours since the last recorded precipitation was written in this section in hours. This value was determined by the study field staff and recorded in a table.

Outfall Flow Measurements:
The measured flow in litres per second was recorded in this section.

On-Site Tests:
The temperature pH and conductivity of the effluent from the outfall was measured and noted in this section.

Observations/Comments:
Field crews recorded any additional pertinent information in this section. Specific observations of interest included any odour, colour or debris, the state of repair of the outfall and any unusual observations.

EQUIPMENT LIST USED IN DRY WEATHER OUTFALL SURVEY

Each Field Crew

2 coolers
4 ice packs
1 plastic bucket
1 plastic litre beaker
1 plastic funnel
1 reverse suction bicycle pump with plastic tubing and one way valve
1 stop watch
2-5 1" corks
1 can fluorescent spray paint
1 35 mm camera with slide film
1 6 m tape measure
1 flexible metal ruler
1 respirator
1 metric thermometer
2 pr work gloves
2 pr rubber gloves
2 pr rubber safety boots
2 pr waders (1 chest, 1 hip)
2 back packs
2 sets sample bottles
1 set field maps, aerial photographs
1 bottle concentrated nitric acid

Laboratory Equipment

1 conductivity bridge
1 pH meter

APPENDIX III

DATA BASE DEFINITIONS

1) Master File Definitions

2) Field Definitions

3) Example Execution Files

MASTER FILE DEFINITIONS

```
ILENAME=MIMICO,SUFFIX=FOC

 SEGNAME=LOCATION,SEGTYPE=S2
   FIELDNAME=REACH,            ALIAS=RCH,          FORMAT=A2,         $
   FIELDNAME=OUTFALL NUM,      ALIAS=OUT,          FORMAT=I3S,        $
   FIELDNAME=MO-NUMBER,        ALIAS=MON,          FORMAT=A6,         $

  SEGNAME=DESCRIPT,PARENT=LOCATION,SEGTYPE=S1
   FIELDNAME=OUTFALL-TYPE,     ALIAS=OTYPE,        FORMAT=A2,         $
   FIELDNAME=PIPE-DIM-1,       ALIAS=SIZE1,        FORMAT=I4S,        $
   FIELDNAME=PIPE-DIM-2,       ALIAS=SIZE2,        FORMAT=I4S,        $
   FIELDNAME=DESCRIPTION,      ALIAS=OUTDES,       FORMAT=A25,        $
   FIELDNAME=PIPE MAT,         ALIAS=MATERIAL,     FORMAT=A3,         $

 SEGNAME=ONSITE,PARENT=DESCRIPT,SEGTYPE=S1
   FIELDNAME=DATE,             ALIAS=,             FORMAT=I6DMY,      $
   FIELDNAME=TIME,             ALIAS=,             FORMAT=I4S,        $
   FIELDNAME=LAST PRECIP,      ALIAS=RAIN,         FORMAT=I3S,        $
   FIELDNAME=CREW,             ALIAS=,             FORMAT=A2,         $
   FIELDNAME=RUN-NO,           ALIAS=RUN,          FORMAT=A2,         $
   FIELDNAME=CONDUCTIVITY,     ALIAS=CON,          FORMAT=I5S,        $
   FIELDNAME=PH,               ALIAS=,             FORMAT=D4.1S,      $
   FIELDNAME=TEMPERATURE,      ALIAS=TEMP,         FORMAT=D4.1S,      $
   FIELDNAME=RF,               ALIAS=,             FORMAT=A1,         $
   FIELDNAME=FLOW,             ALIAS=,             FORMAT=D8.2SC,     $
   FIELDNAME=WET-DRY,          ALIAS=,             FORMAT=A1,         $

 SEGNAME=OFFSITE,PARENT=ONSITE,SEGTYPE=S1
   FIELDNAME=REPLICANT,        ALIAS=REP,          FORMAT=I1S,        $
   FIELDNAME=RTP,              ALIAS=,             FORMAT=A1,         $
   FIELDNAME=TOT P,            ALIAS=PHOS,         FORMAT=D7.2CS,     $
   FIELDNAME=RTKN,             ALIAS=,             FORMAT=A1,         $
   FIELDNAME=TKN,              ALIAS=,             FORMAT=D7.2CS,     $
   FIELDNAME=RBOD,             ALIAS=,             FORMAT=A1,         $
   FIELDNAME=BOD,              ALIAS=,             FORMAT=D7.2CS,     $
   FIELDNAME=RSS,              ALIAS=,             FORMAT=A1,         $
   FIELDNAME=SUSP-SOLIDS,      ALIAS=SS,           FORMAT=I10,        $
   FIELDNAME=RPNL,             ALIAS=,             FORMAT=A1,         $
   FIELDNAME=PHENOLS,          ALIAS=PHEN,         FORMAT=D8.3CS,     $
   FIELDNAME=RLD,              ALIAS=,             FORMAT=A1,         $
   FIELDNAME=LEAD,             ALIAS=PB,           FORMAT=D7.2CS,     $
   FIELDNAME=RZN,              ALIAS=,             FORMAT=A1,         $
   FIELDNAME=ZINC,             ALIAS=ZN,           FORMAT=D8.3CS,     $
   FIELDNAME=RCU,              ALIAS=,             FORMAT=A1,         $
   FIELDNAME=COPPER,           ALIAS=CU,           FORMAT=D8.3CS,     $
   FIELDNAME=RCHR,             ALIAS=,             FORMAT=A1,         $
   FIELDNAME=CHROME,           ALIAS=CHR,          FORMAT=D8.3CS,     $
   FIELDNAME=RIR,              ALIAS=,             FORMAT=A1,         $
   FIELDNAME=IRON,             ALIAS=FE,           FORMAT=D7.2CS,     $
   FIELDNAME=RFC,              ALIAS=,             FORMAT=A1,         $
   FIELDNAME=FECAL COLI,       ALIAS=FC,           FORMAT=I9CS,       $
   FIELDNAME=RFS,              ALIAS=,             FORMAT=A1,         $
   FIELDNAME=FECAL STREP,      ALIAS=FS,           FORMAT=I9CS,       $
   FIELDNAME=BLANK-1,          ALIAS=,             FORMAT=A20,        $
   FIELDNAME=BLANK-2,          ALIAS=,             FORMAT=I9CS,       $
   FIELDNAME=BLANK-3,          ALIAS=,             FORMAT=D7.2CS,     $
   FIELDNAME=BLANK-4,          ALIAS=,             FORMAT=D7.2CS,     $
   FIELDNAME=BLANK-5,          ALIAS=,             FORMAT=D7.2CS,     $
   FIELDNAME=BLANK-6,          ALIAS=,             FORMAT=D7.2CS,     $
   FIELDNAME=BLANK-7,          ALIAS=,             FORMAT=D7.2CS,     $
```

FIELD DEFINITIONS

Filename MIMICO:

Multisegment File with focus suffix.
Segment Name = Location

Reach, alias RCH:

2 alphanumeric characters designating each reach.

Outfall Number, alias OUT:

Up to 3 intergers designating an outfall; i.e. outfall num: 504.

MO-Number, alias MON:

6 alphanumeric characters reserved for municipal outfall numbers.

Segname Description, PARENT LOCATION

Outfall-Type, alias OTYPE:

2 alphanumeric digits representing the type of outfall; i.e. P - pipe.

Pipe-Dim-1, alias SIZE1:

4 interger numbers defining the outfall diameter in inches or, in case of rectangular or oval pipes, the length.

N/A for tribs or ditches.

Pipe-Dim-2, alias SIZE2:

4 interger numbers defining the width of the outfall when necessary.

Description, alias OUTDES:

25 alphanumeric characters used to describe the pipe, usually shape; i.e. circ, square.

Pipe Mat, alias MATERIAL:

3 digit alphanumeric code representing outfall material (i.e. concrete = con).

Segment Name - On-Site: Parent Descript.

Date: A 6 digit interger code representing the date of the sample. Format is day, month, year (i.e. Aug. 25, 1984: 250884).

Time: A 4 digit interger defining the time of the sample in hours, minutes (i.e. 1.32 pm: 1332).

Last Precip, alias RAIN:

A 3 digit interger representing hours elapsed since last rainfall.

Crew: Two alphanumeric characters representing each crew.

Conductivity, alias CON:

Up to a 5 digit interger number representing conductivity in umhos @ 25°C.

pH: A 3 digit (including 1 decimal place) number representing pH (i.e. 7.2).

Temperature, alias TEMP:

A 3 digit number representing temperature in degrees Celsius (i.e. 32.4°C = 32.4).

RF: An alphanumeric character providing an indication of less than or greater than flow.
During computation, the value will be treated as =

Flow: Up to a 6 digit number including 3 decimal places used to represent flow at the outfall in litres/second.

Wet-Dry, alias WET:

1 alphanumeric character defining an outfall as either wet, dry or submerged.

Segment Name - Off-Site: Parent On-Site

Replicant, alias REP:

Up to a 3 digit number representing the replicated data (i.e. if the outfall was sampled 3 times in one visit, the data for that visit will be entered as 3 separate replicates).

RTP: 1 alphanumeric character to allow the entry of ">" "<" to total phosphorus. This field is not considered during computations. Also included are:

RTKN	for	TKN	alias,
RBOD		BOD	
RSS		Suspended Solids	SS
RPNL		Phenols	
RLD		Lead	PB
RZN		Zinc	ZN
RCU		Copper	CU
RCHR		Chrome	
RIR		Iron	FE
RFC		Fecal Coliform	FC
RFS		Fecal Streptococcus	FS

Tot P, alias PHOS:

Up to a 4 digit number with 2 decimal (xxx.dd) represent total phosphorus lab results in mg/L.

Similar treatment for	TKN, Iron	(xxxx.dd)
	Lead, Zinc, Copper, Chrome	(xxxx.ddd)
	BOD	(xxxx.d)
	Suspended Solids	(xxxxxxx)

Phenols:

Up to a 4 digit number with 2 decimal places representing phenol lab results in ug/L.

Fecal Coliform, Fecal Streptococcus:

Up to a 9 digit interger representing the bacterial count in org./100 mL.

Run-No, alias RUN:

2 alphanumeric characters representing the run-no and differentiating between intensive and screening runs (i.e. screening runs indicated as R1, R2, R3; intensive runs indicates as I1, I2, I3).

Blank-1, ... Blank-6:

Extra fields created for new sampling parameters, these fields can be renamed and reformatted only through the rebuild OR an alias may just be entered in the master file description.

APPENDIX IV

QUALITY ASSURANCE DATA

1) Variance Attributable to Sampling

2) Differences Between Laboratories for Conventional Parameters and Heavy Metals

3) Inter-laboratory Comparison of Bacteriological Analyses

VARIANCE ATTRIBUTABLE TO SAMPLING

FIGURE NO.	PARAMETER	LINEAR REGRESSION EQUATION	CORRELATION COEFFICIENT
IV-1	BOD	y = 0.94 x - 0.07	r = 0.99
IV-2	SS	y = 1.04 x - 0.89	r = 0.98
IV-3	Total P	y = 1.00 x + 0.03	r = 0.81
IV-4	TKN	y = 0.97 x - 0.03	r = 0.99
IV-5	Zinc	y = 1.03 x - 0.003	r = 0.99
IV-6	Lead	y = 1.17 x - 0.01	r = 0.93
IV-7	Copper	y = 1.05 x - 0.0003	r = 1.00
IV-8	Chromium	y = 1.00 x - 0.0007	r = 1.00
IV-9	Iron	y = 1.36 x - 0.12	r = 0.93

Note: y = Replicate 2

x = Replicate 1

Both replicates analyzed by same laboratory

DIFFERENCES BETWEEN LABORATORIES FOR CONVENTIONAL PARAMETERS AND HEAVY METALS

FIGURE NO.	PARAMETER	LINEAR REGRESSION EQUATION	CORRELATION COEFFICIENT
IV-10	BOD	y = 1.04 x + 0.27	r = 0.88
IV-11	SS	y = 0.68 x - 0.06	r = 0.99
IV-12	Total P	y = 1.00 x + 0.01	r = 0.92
IV-13	TKN	y = 0.78 x - 0.07	r = 0.94
IV-14	Zinc	y = 0.87 x - 0.004	r = 0.90
IV-15	Lead	y = 0.14 x + 0.06	r = 0.11
IV-16	Copper	y = 0.07 x - 0.007	r = 0.28
IV-17	Chromium	y = 1.01 x + 0.004	r = 0.95
IV-18	Iron	y = 0.78 x + 0.25	r = 0.84

Note: y = Analyzed by IEC Beak

x = Analyzed by MOE

No assessment of phenols was carried out due to the limited number of observations.

LIST OF FIGURES

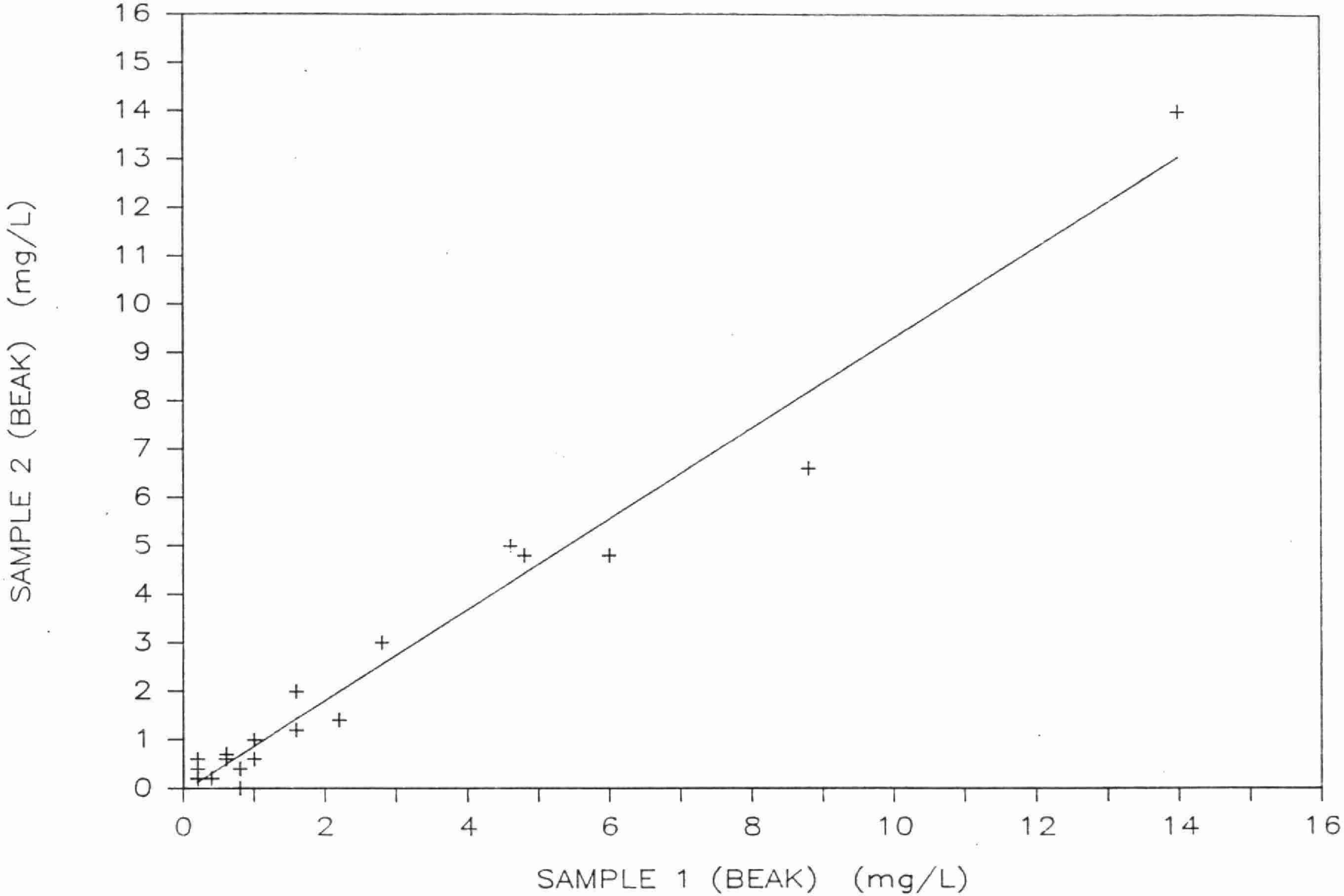

FIGURE IV-1. ANALYSIS OF SAMPLING VARIANCE OF BIOCHEMICAL OXYGEN DEMAND (BOD)

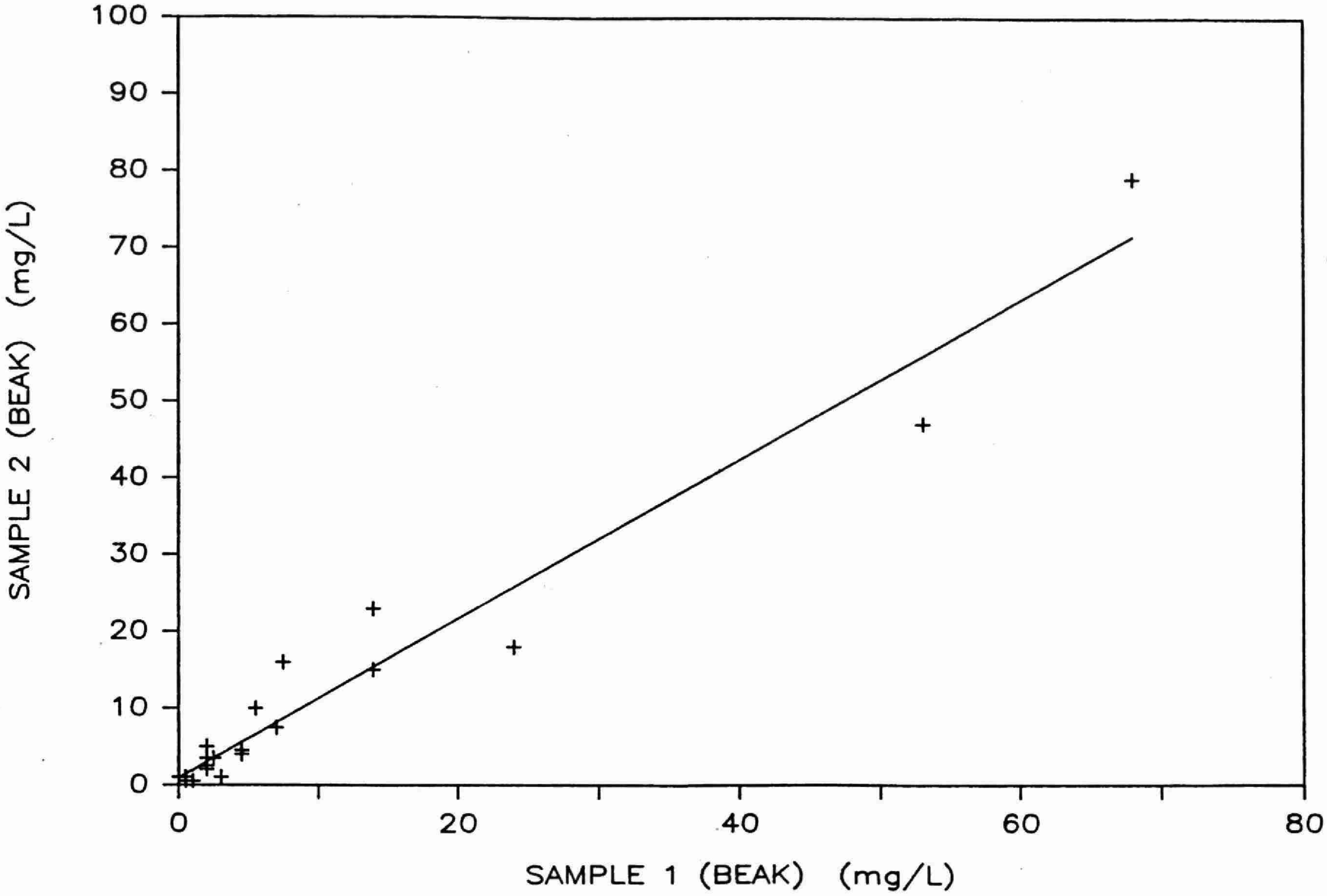

FIGURE IV-2. ANALYSIS OF SAMPLING VARIANCE OF SUSPENDED SOLIDS

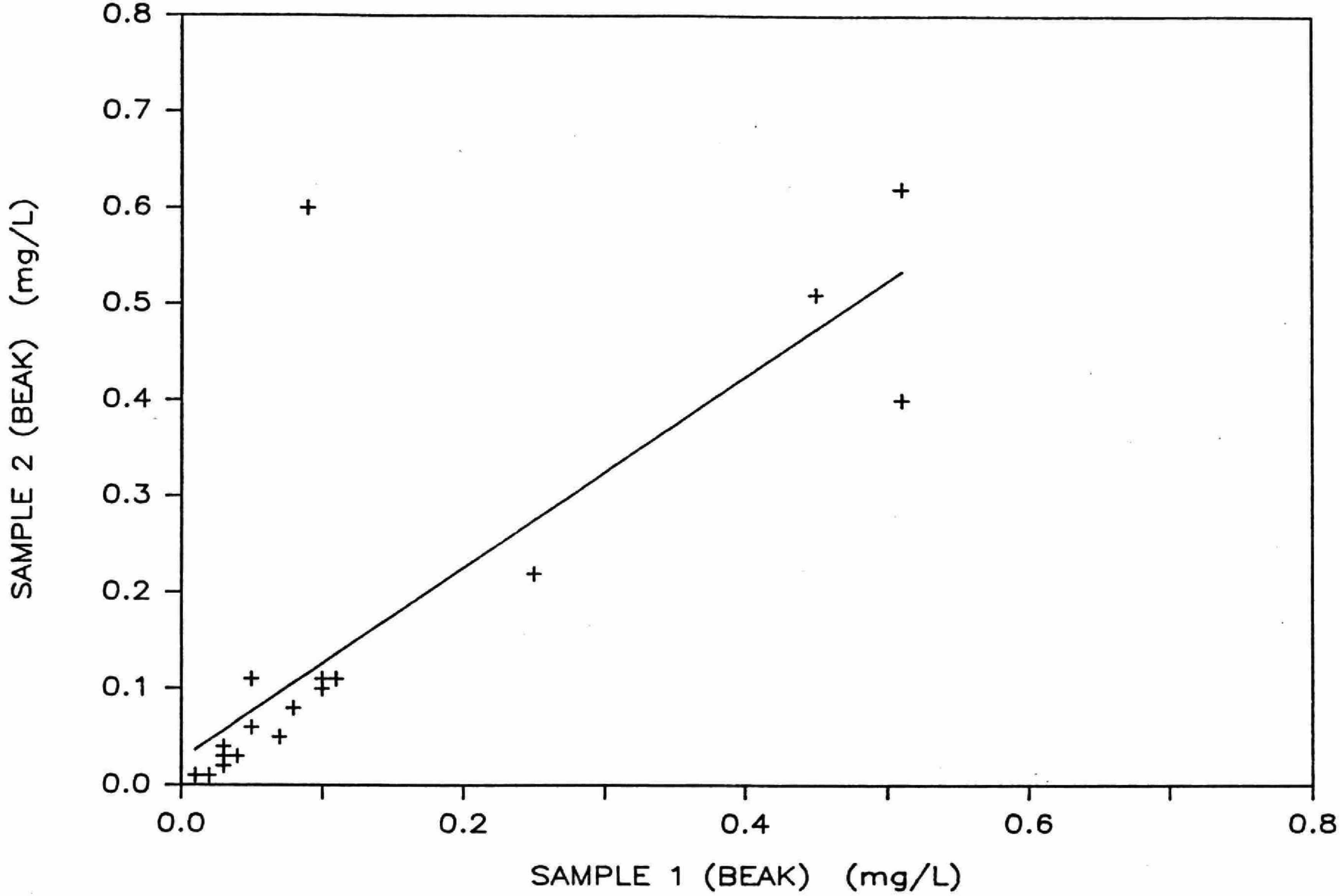

FIGURE IV-3. ANALYSIS OF SAMPLING VARIANCE OF TOTAL PHOSPHORUS

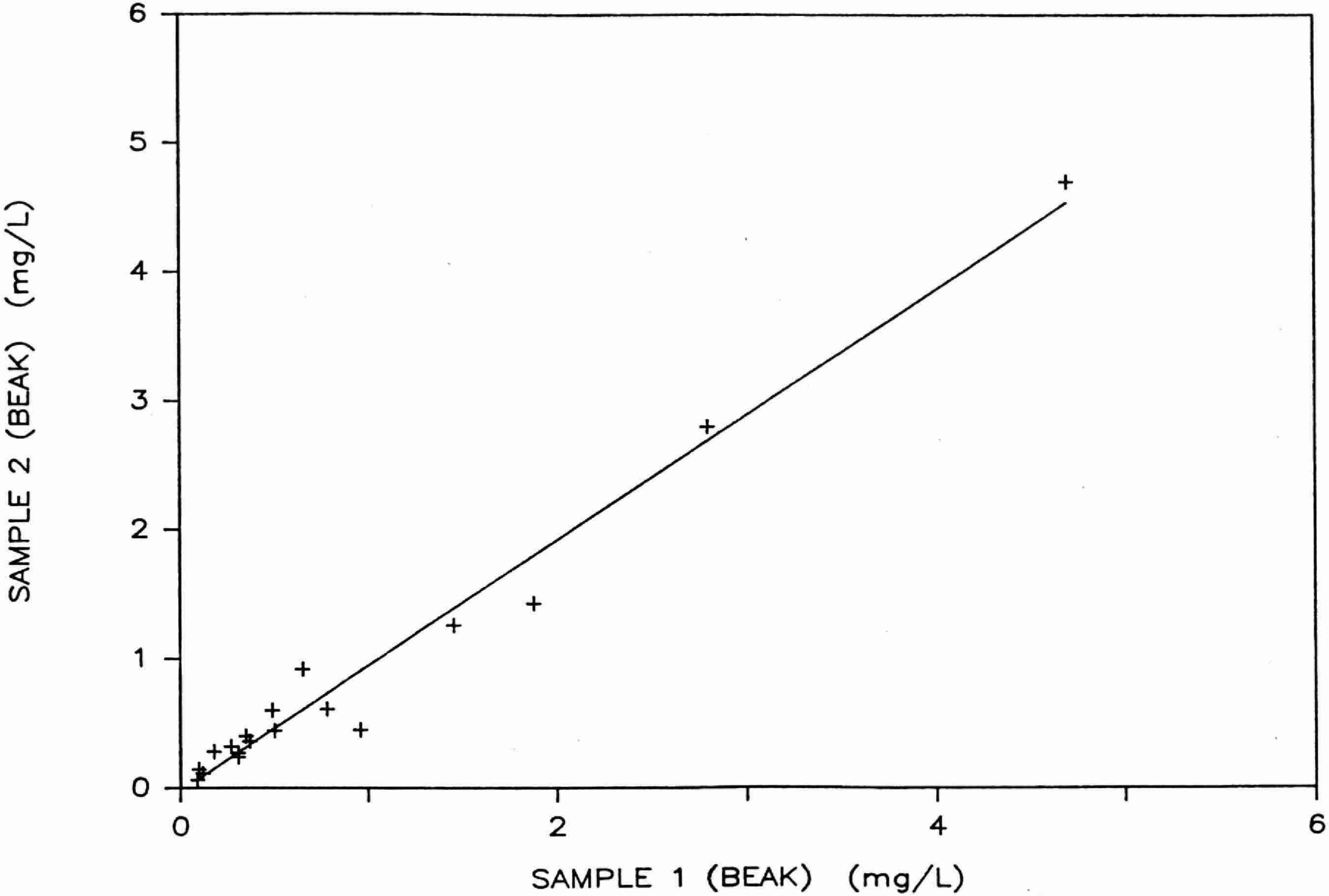

FIGURE IV-4. ANALYSIS OF SAMPLING VARIANCE OF TOTAL KJELDAHL NITROGEN (TKN)

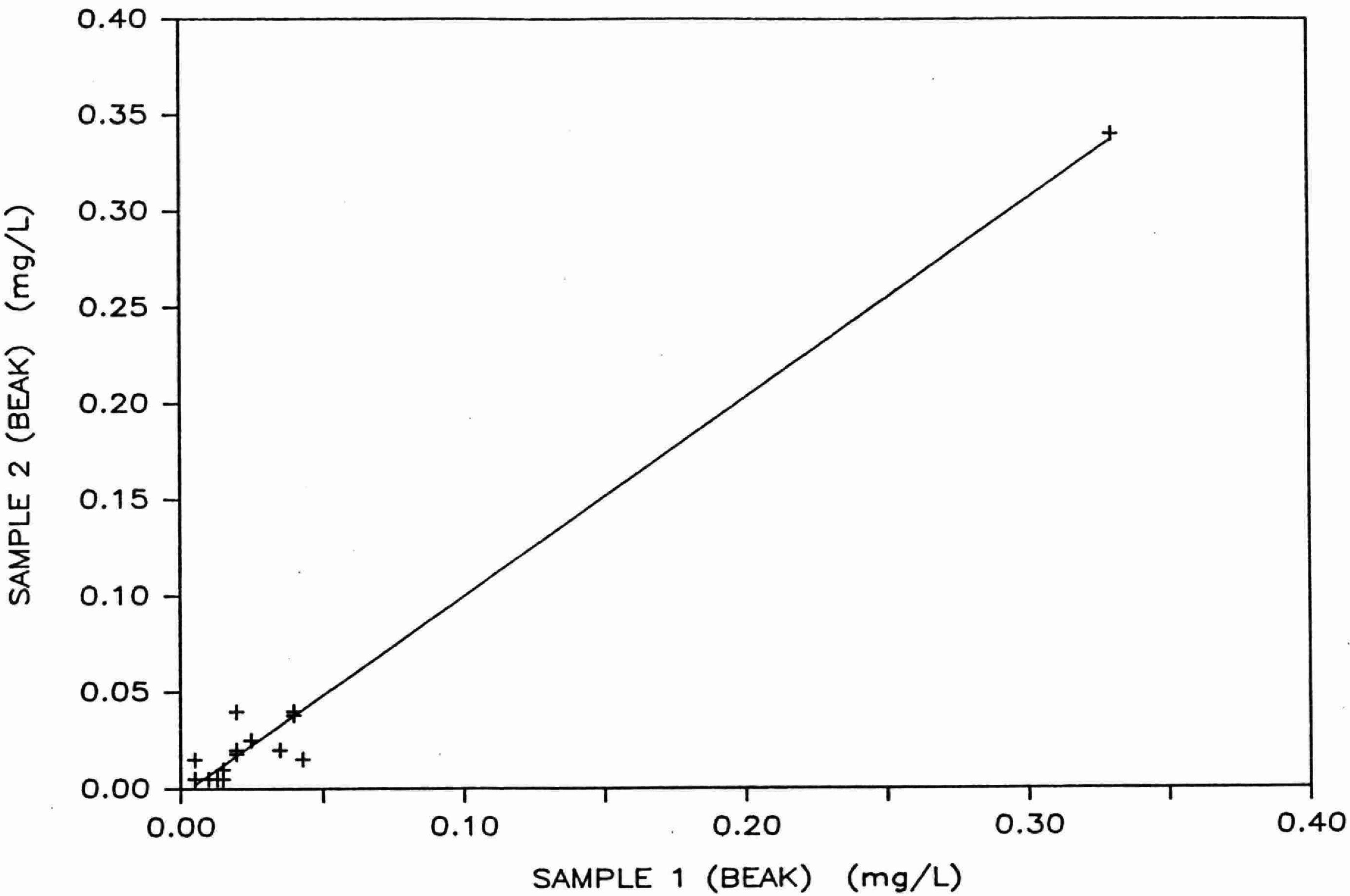

FIGURE IV-5. ANALYSIS OF SAMPLING VARIANCE OF ZINC

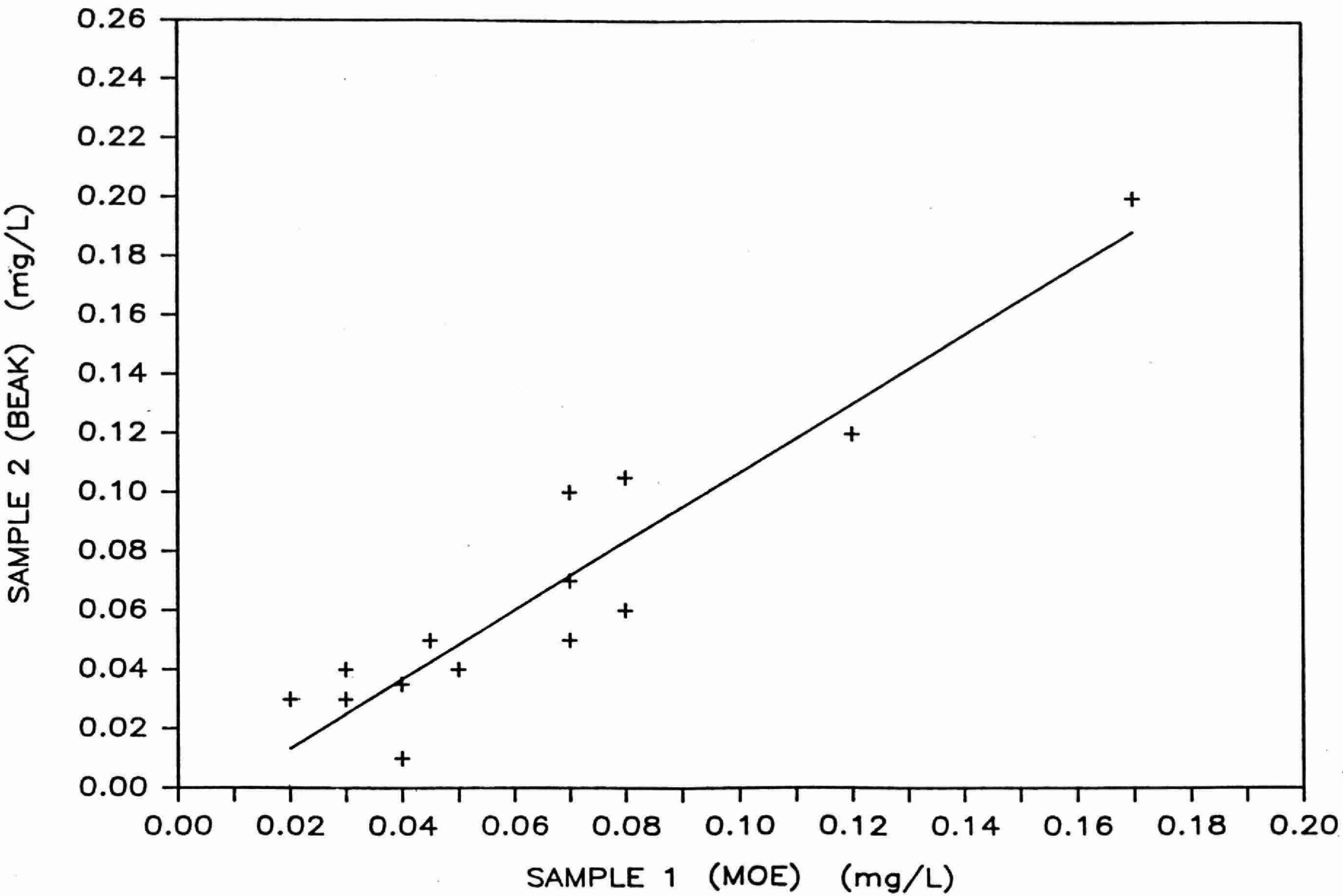

FIGURE IV-6. ANALYSIS OF SAMPLING VARIANCE OF LEAD

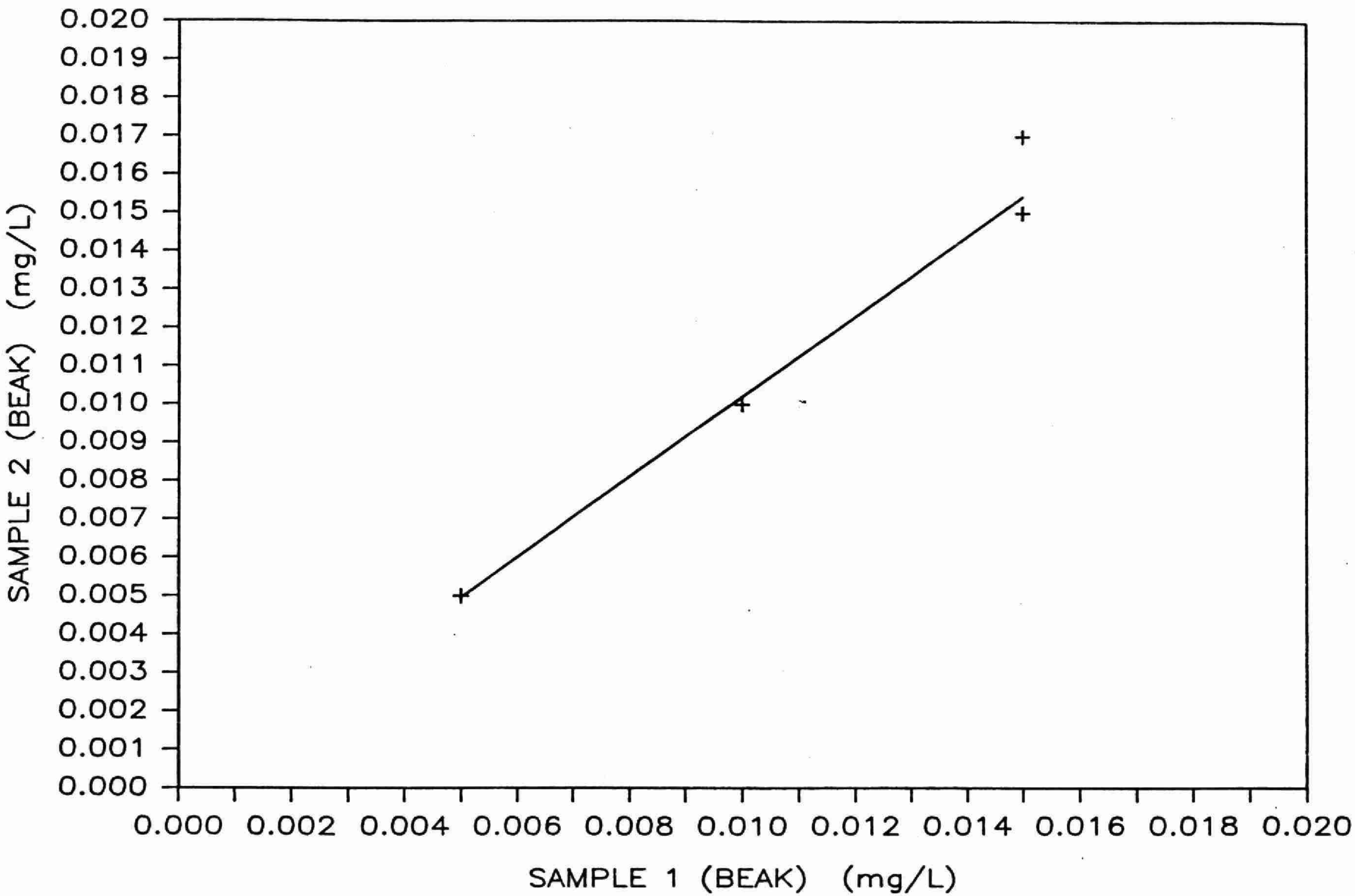

FIGURE IV-7. ANALYSIS OF SAMPLING VARIANCE OF COPPER

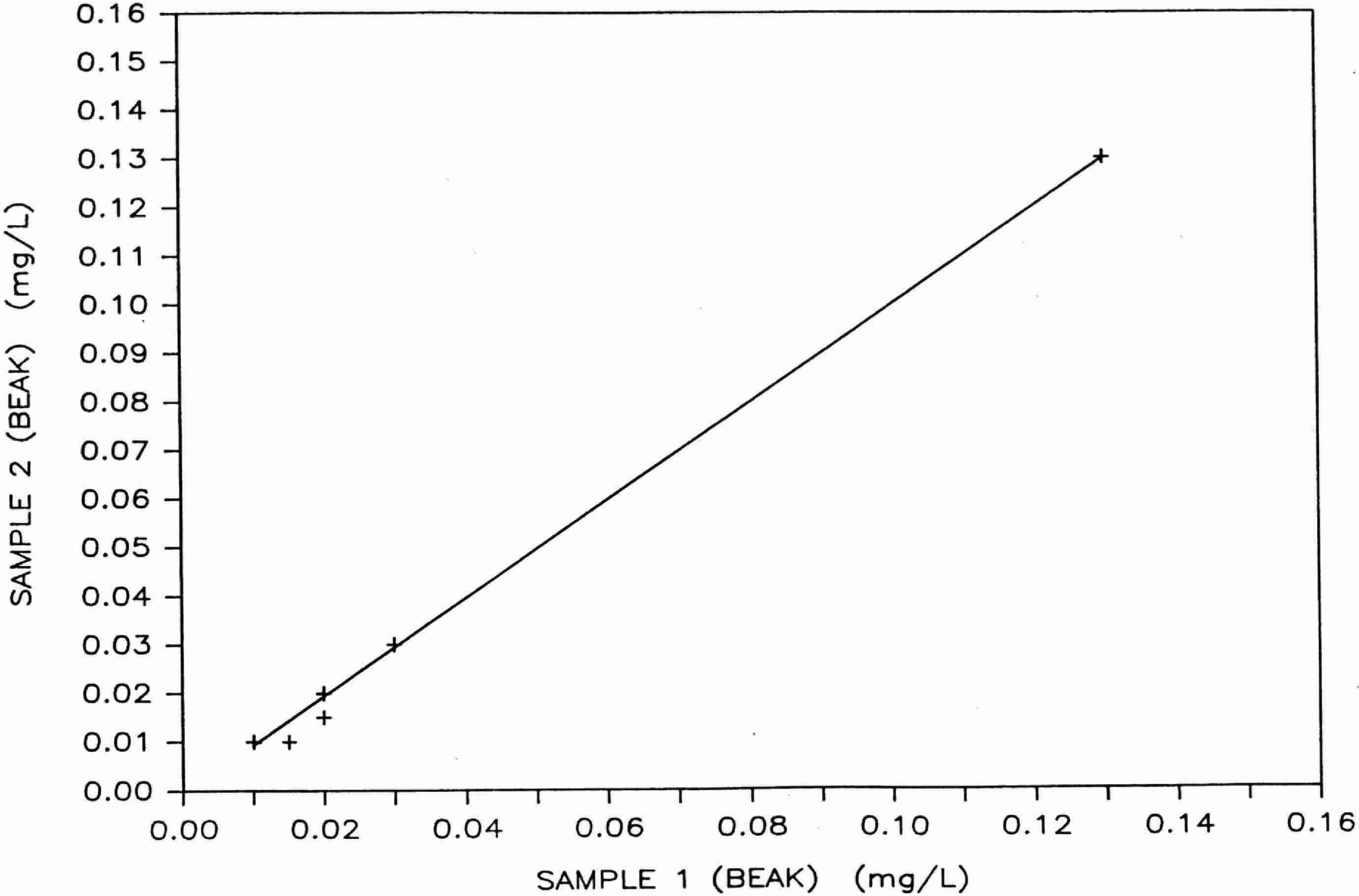

FIGURE IV-8. ANALYSIS OF SAMPLING VARIANCE OF CHROMIUM

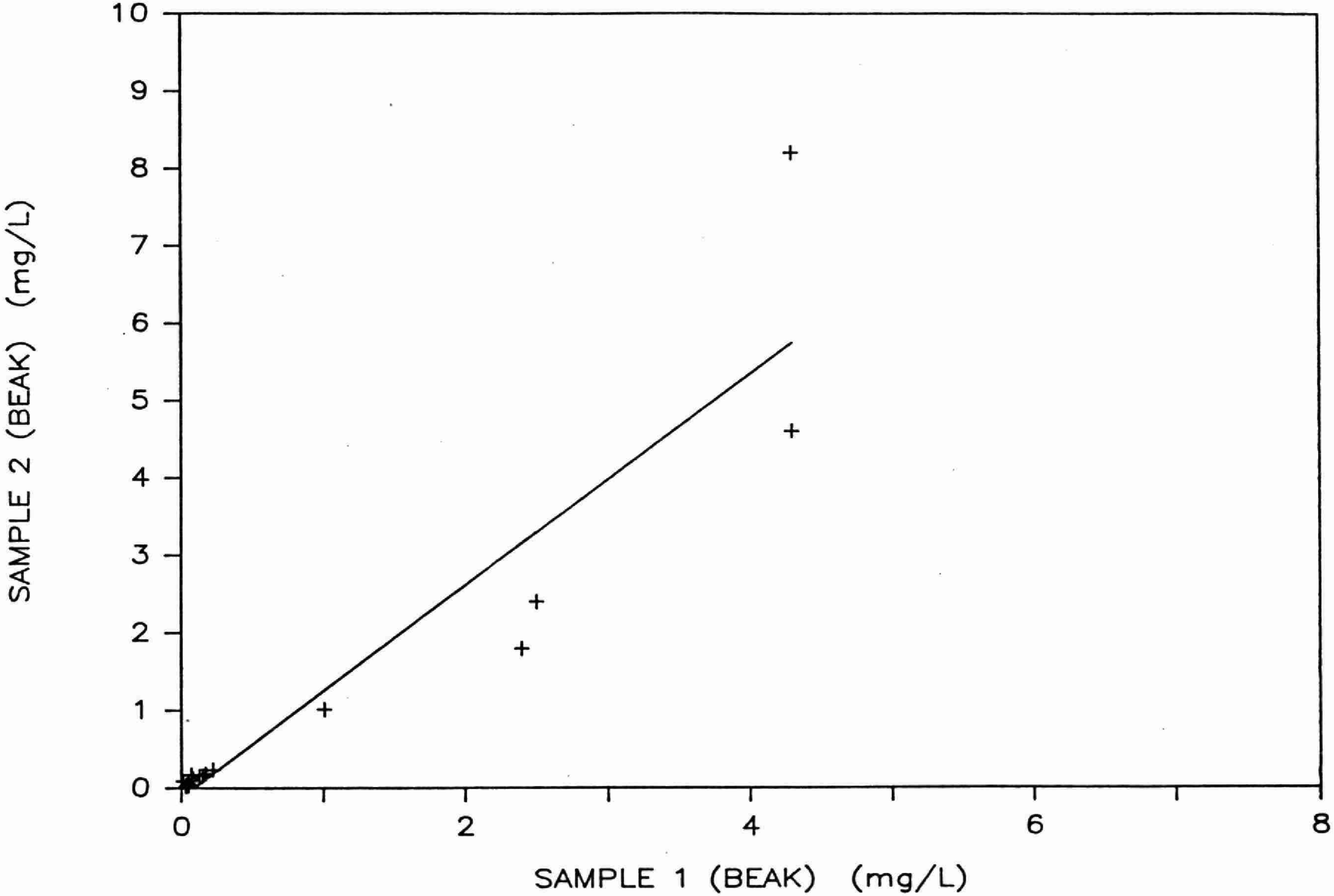

FIGURE IV-9. ANALYSIS OF SAMPLING VARIANCE OF IRON

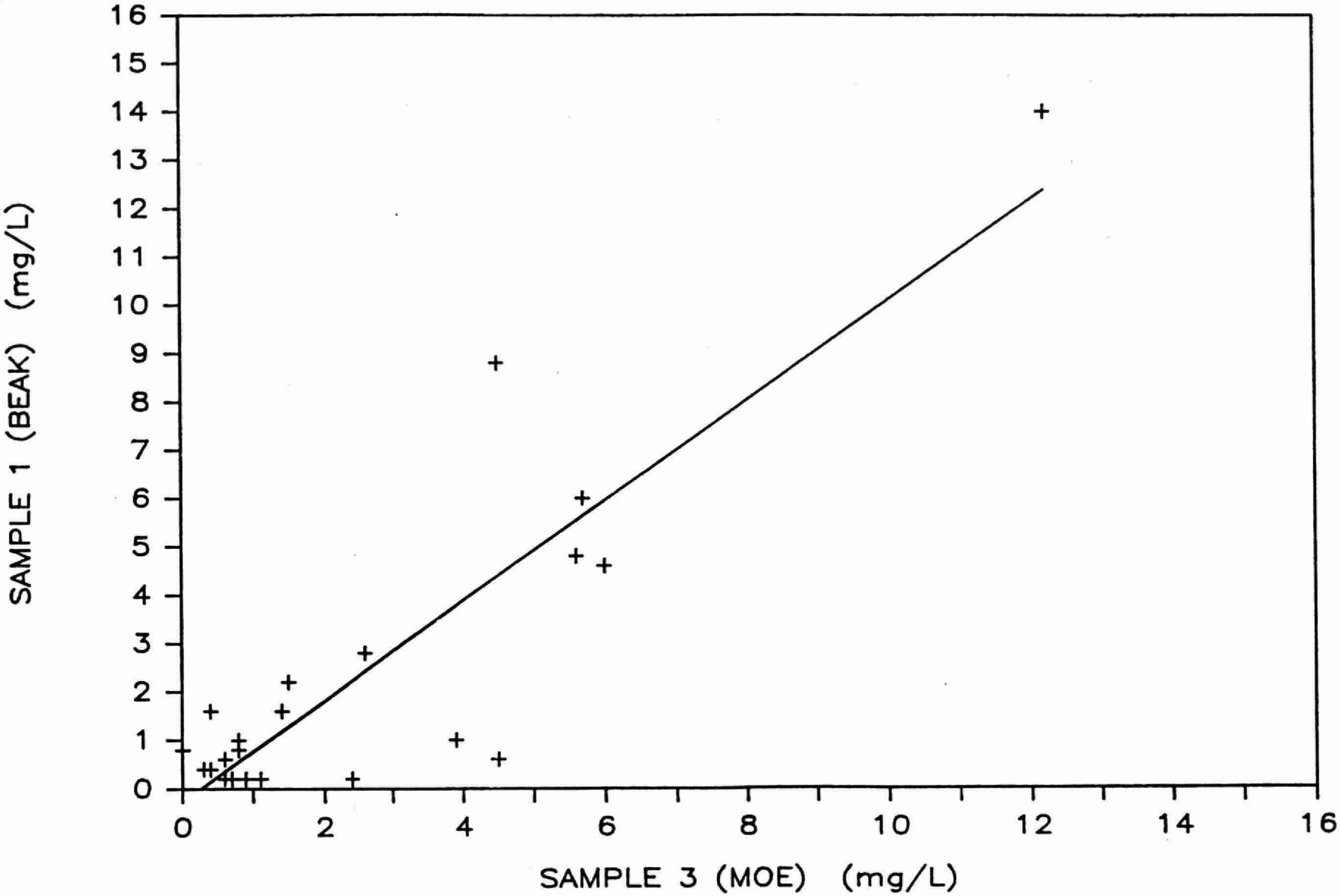

FIGURE IV-10. ANALYSIS OF ANALYTICAL VARIANCE OF BIOCHEMICAL OXYGEN DEMAND (BOD)

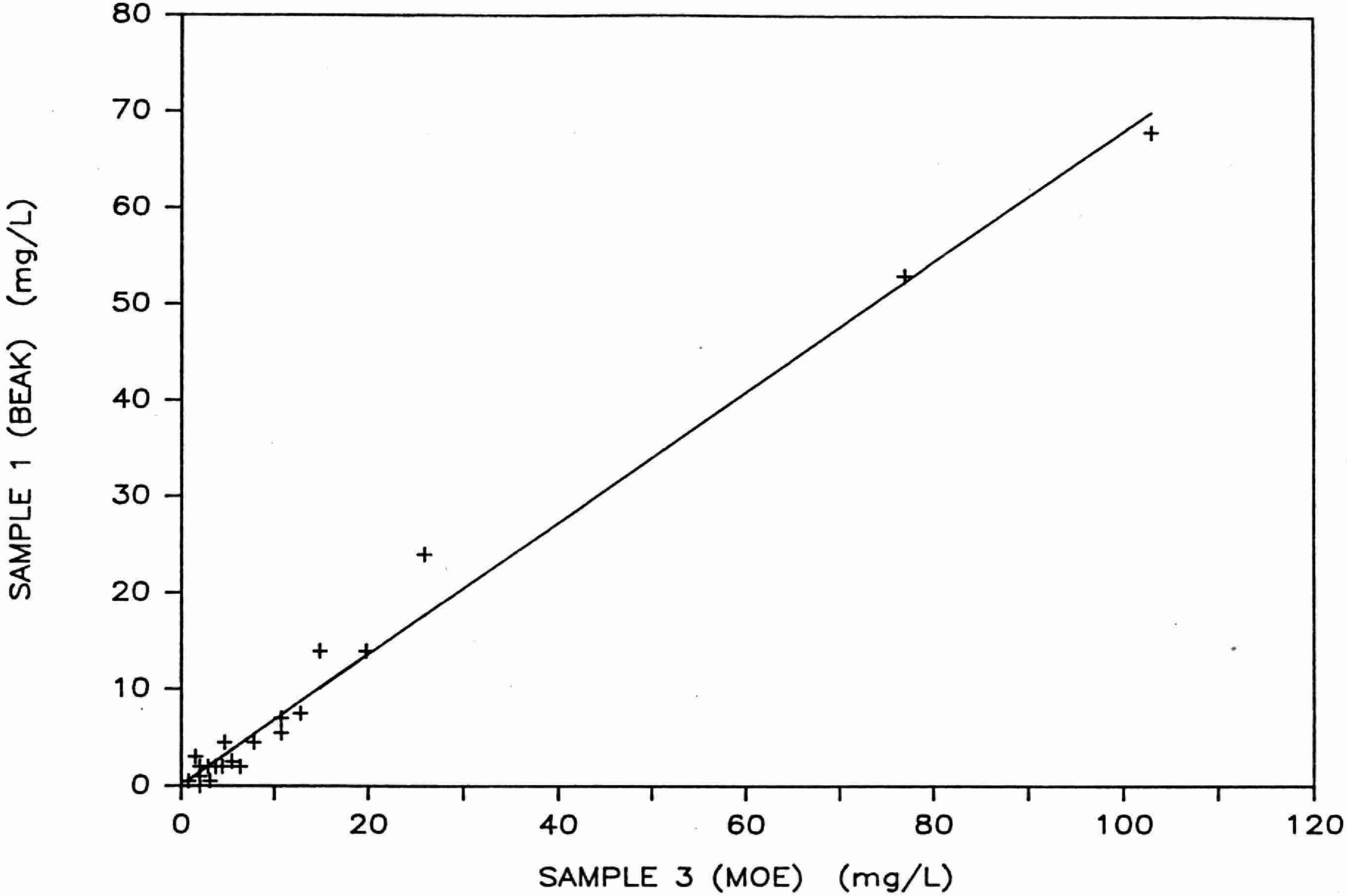

FIGURE IV-11. ANALYSIS OF ANALYTICAL VARIANCE OF SUSPENDED SOLIDS

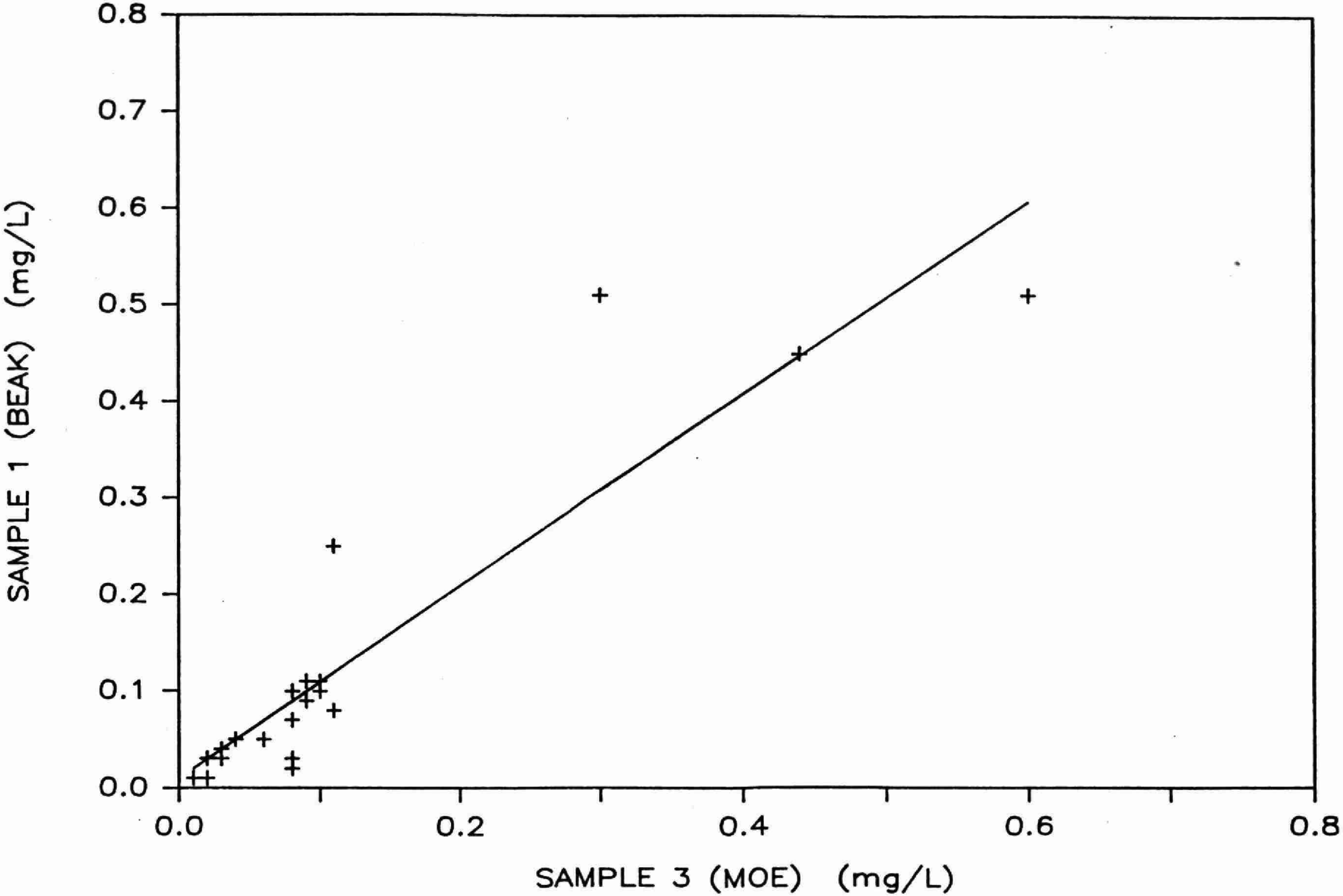

FIGURE IV-12. ANALYSIS OF ANALYTICAL VARIANCE OF TOTAL PHOSPHORUS

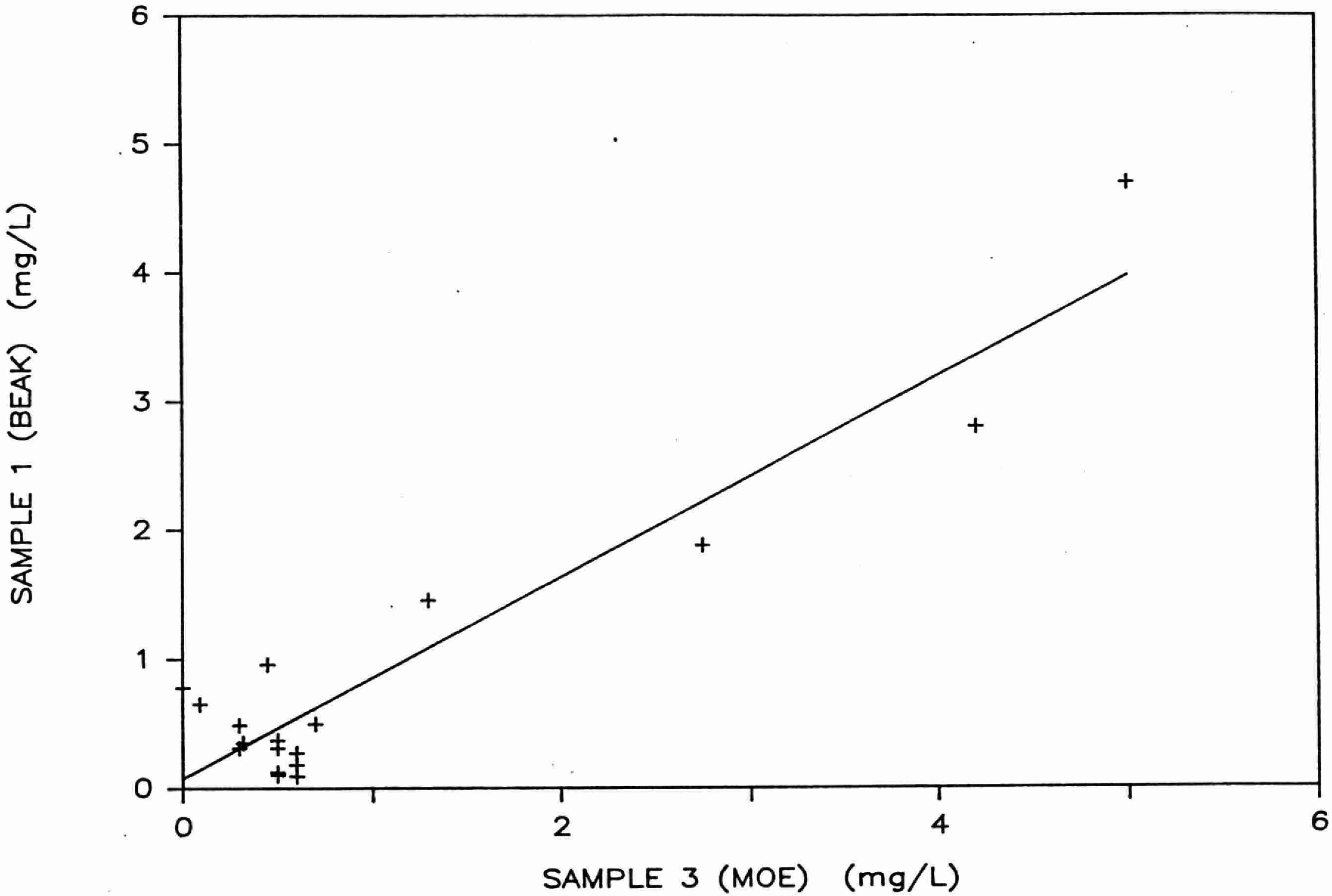

FIGURE IV-13. ANALYSIS OF ANALYTICAL VARIANCE OF TKN

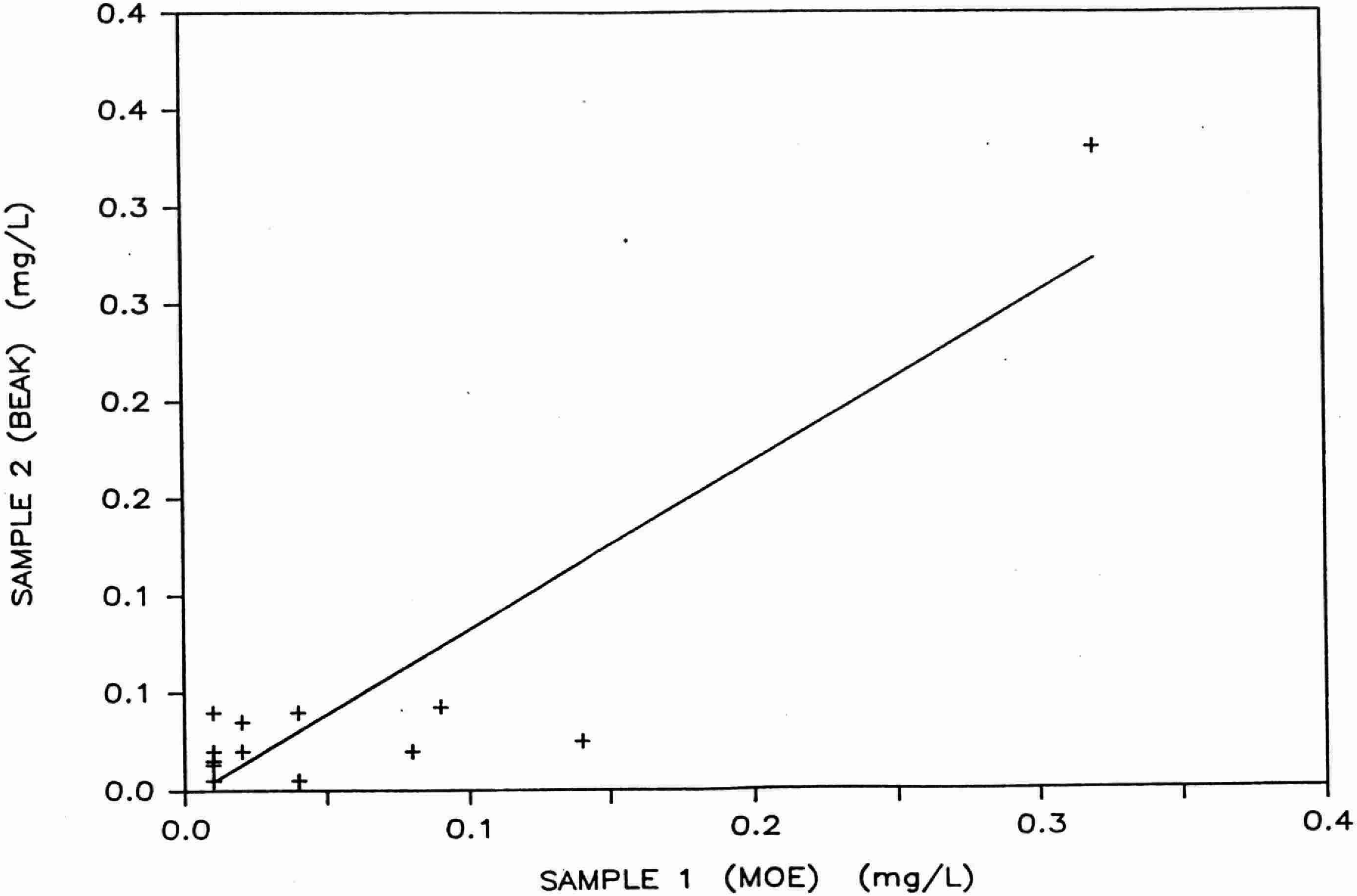

FIGURE IV-14. ANALYSIS OF ANALYTICAL VARIANCE OF ZINC

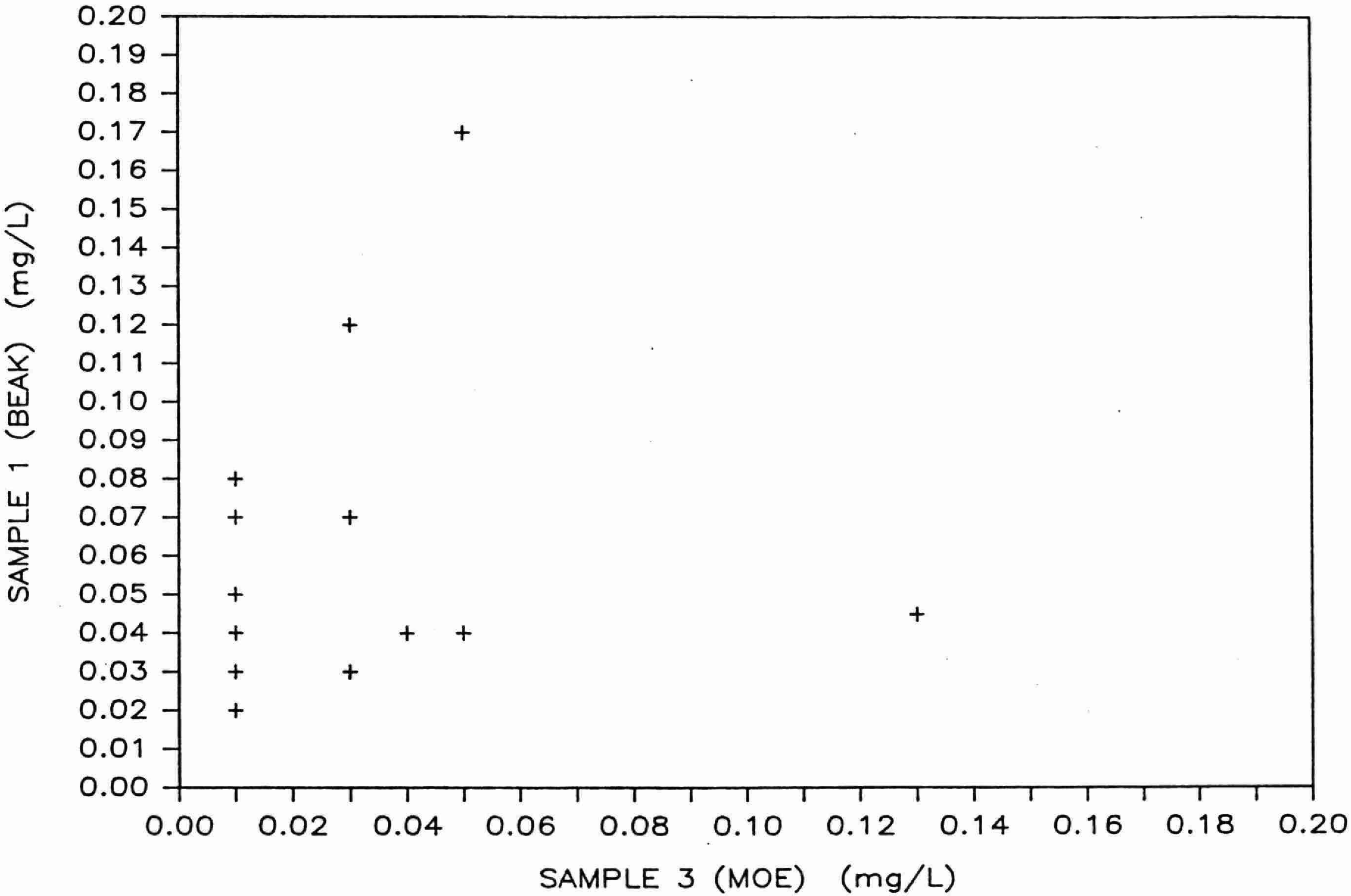

FIGURE IV-15. ANALYSIS OF ANALYTICAL VARIANCE OF LEAD

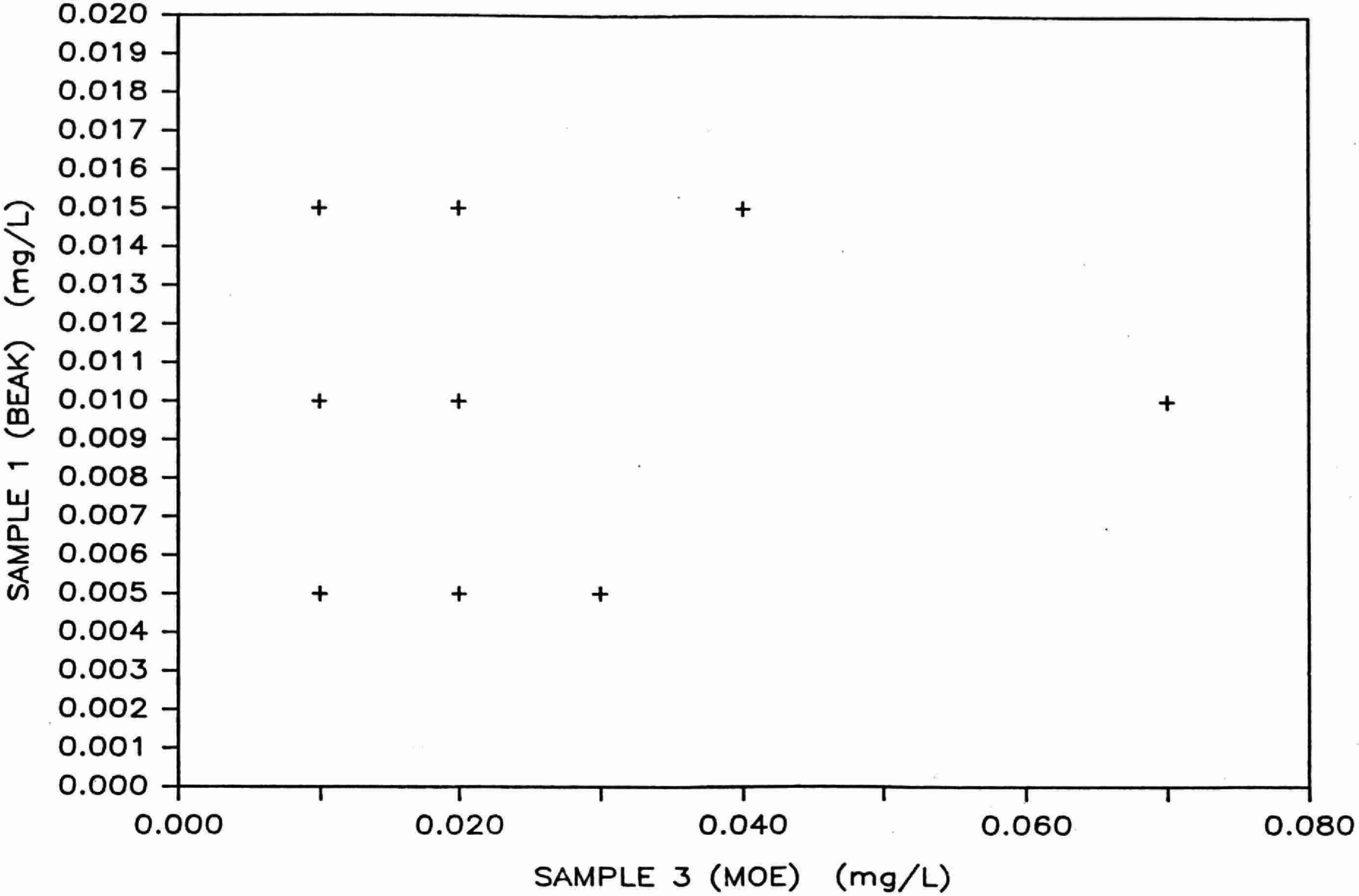

FIGURE IV-16. ANALYSIS OF ANALYTICAL VARIANCE OF COPPER

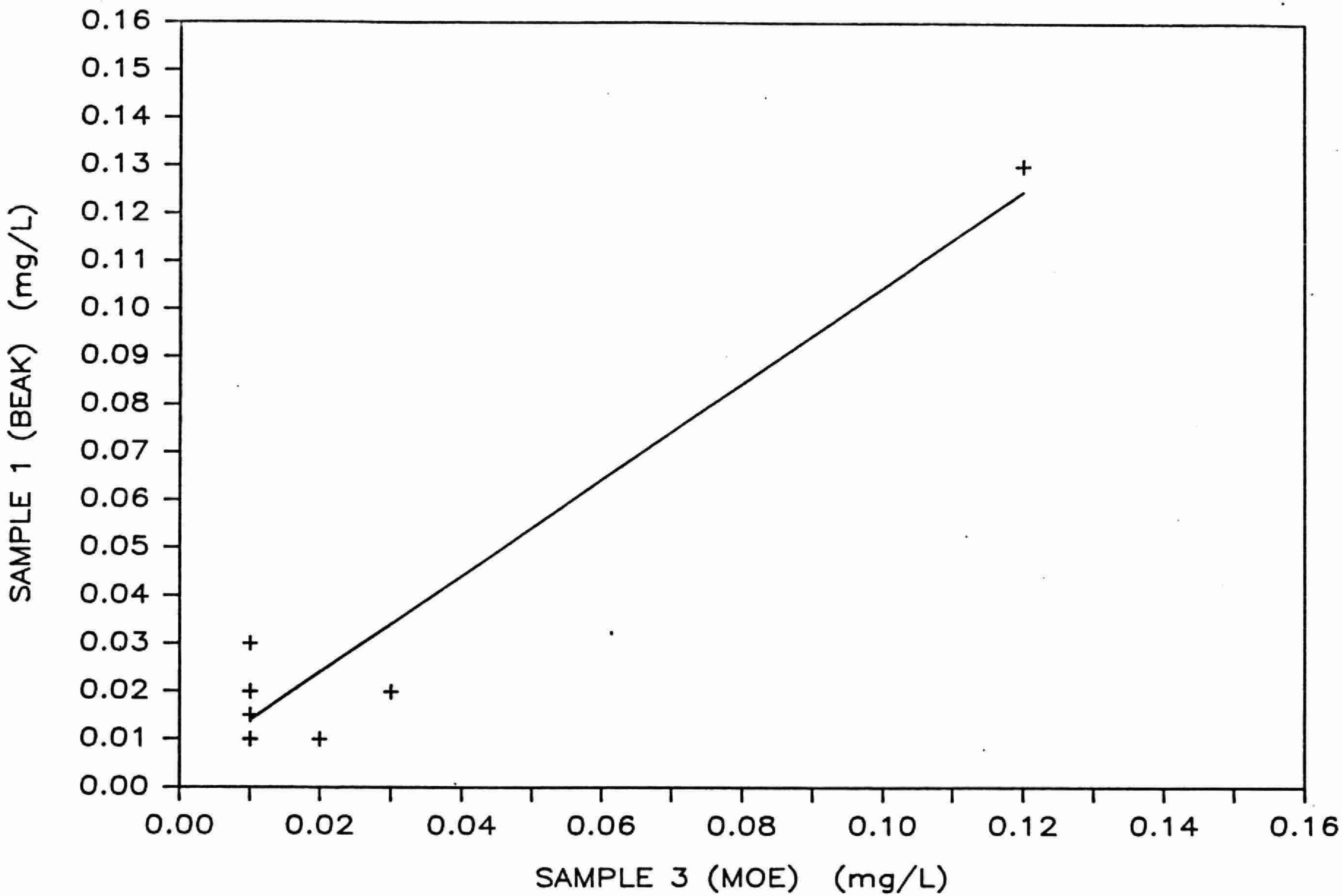

FIGURE IV-17. ANALYSIS OF ANALYTICAL VARIANCE OF CHROMIUM

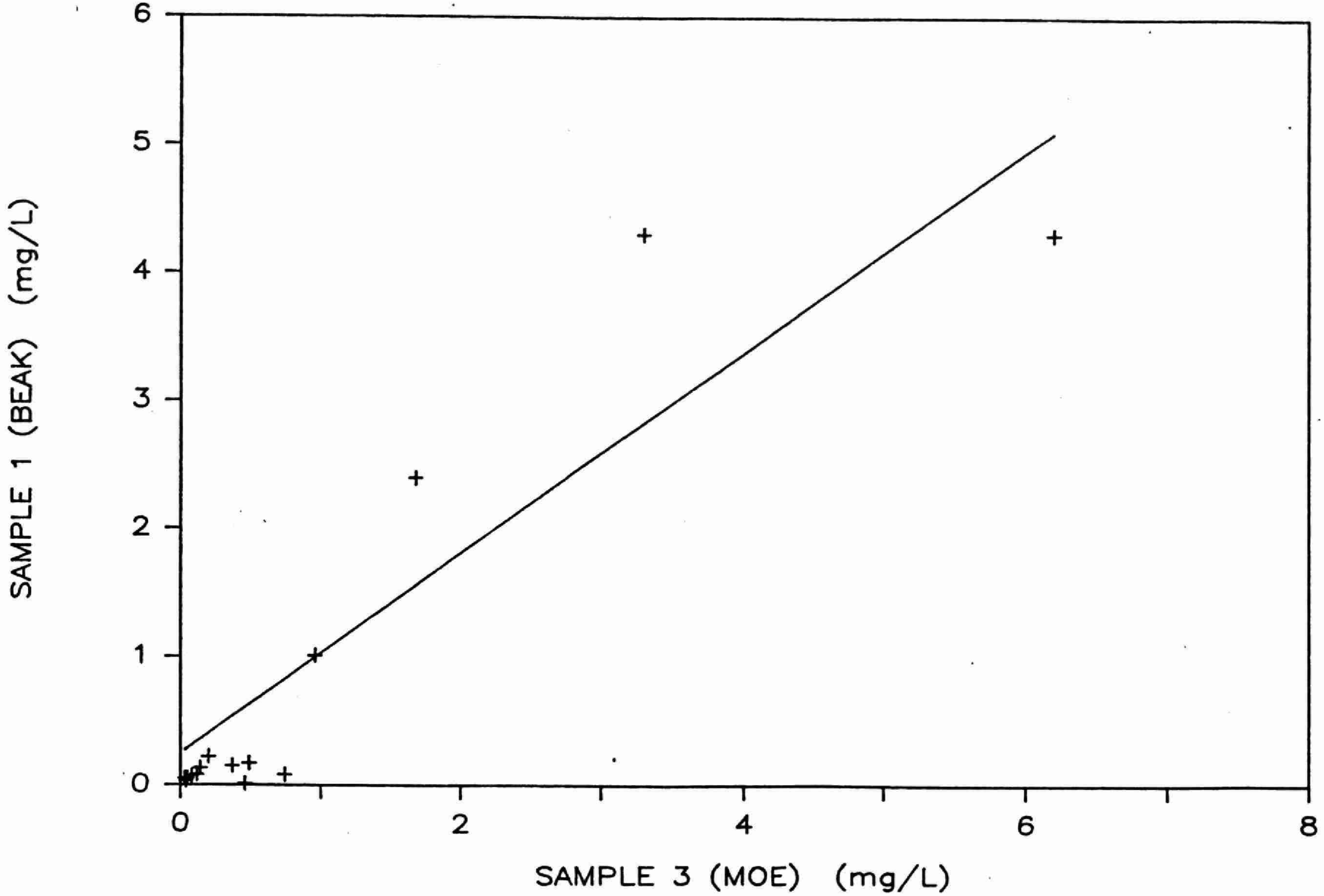

FIGURE IV-18. ANALYSIS OF ANALYTICAL VARIANCE OF IRON

INTERLAB COMPARISON OF FECAL COLIFORM AND FECAL STREPTOCOCCUS RESULTS
(MOE AND YOUNG AND ASSOCIATES LABORATORIES)

PARAMETER	LAB	REP	RAW DATA (org/filter) 1	2	3	4	5	GROUP STATISTIC	CONCLUSION AT .05
Fecal Coliform	MOE	1	5	9	3	5	5	x = 2.089	No Significant Difference
		2	4	2	5	2	6	S^2 = .3636	
		3	7	2	6	6	2	N = 15	
								RMS = 4.4	
	Young & Assoc.	1	6	8	6	4	4	x = 3.32	
		2	9	9	3	2	9	S^2 = .3938	
		3	10	5	7	2	2	N = 15	
								RMS = 5.4	
Fecal Streptococcus	MOE	1	15	13	12	7	12	x = 3.22	No Significant Difference
		2	11	5	14	12	12	S^2 = .225	
		3	9	2	6	10	9	N = 15	
								RMS = 10.4	
	Young & Assoc.	1	12	10	14	14	9	x = 3.41	
		2	12	13	12	12	16	S^2 = .117	
		3	8	12	14	9	9	N = 15	
								RMS = 4.4	

APPENDIX V

SUMMARY OF GROUP A AND GROUP B OUTFALLS

1) Summary of Group A Outfalls for Fecal Coliform Violations Ranked by Loadings

2) Summary of Group A Outfalls for All Other Parameter Violations Ranked by the Number of Modified Bylaw Violations and Average Loadings

3) Summary of Group B Outfalls for Fecal Coliform Violations Ranked by Average Loadings

4) Summary of Group B Outfalls for All Other Parameter Violations Ranked by Number of Modified Bylaw Violations and Average Loadings

MIMICO CREEK GROUP A OUTFALLS

PRIORITY OUTFALLS FOR FECAL COLIFORM VIOLATIONS
RANKED BY LOADING

REACH	OUTFALL	FECAL COLIFORMS	
		COUNTS/SECONDS	COUNTS/100 ml
MA	23	1279466	12967
	17	29718	3492
MB	67	371456	31302
	59	216300	1960
	34	51008	7531
	61	29259	1541
ML	52	329915	85325
	62	119412	33655
	91	16724	7753
MD	127	98750	4030
MG	517	1973500	87066
	526	1692529	1090814
	511	871266	75361
	509	44450	2315
	514	23841	2424
	524	13703	1223
MH	536	837420	4721
	532	364759	35937

MIMICO CREEK GROUP A OUTFALLS (CONT'D)

PRIORITY OUTFALLS OTHER THAN FECAL COLIFORMS

RANKED BY VIOLATIONS AND LOADINGS

NUMBER OF VIOLATIONS	REACH	OUTFALL NUMBER	LOAD AVERAGE (gm/day)
BOD			
5	MG	509	2.22×10^4
3	MA	19	1.68×10^4
	MG	517	6.83×10^3
	MB	61	3.01×10^3
2	MG	526	244
1	MA	23	4.10×10^4
	MB	59	4.85×10^3
	MA	18	2.14×10^3
TOTAL PHOSPHORUS			
4	MA	23	3.19×10^3
	MB	53	3
2	MG	509	138
1	MG	517	117
	MA	19	53
	MG	526	6
SUSPENDED SOLIDS			
6	MG	509	6.27×10^3
2	MA	18	3.82×10^3
	MG	517	2.20×10^3
	MG	526	468
1	MA	23	1.59×10^4
	MC	105	9.48×10^3
	MA	15	2.81×10^3
	MA	19	1.98×10^3
	ME	137	49
ZINC AND CHROMIUM			
1	MA	23	367 (zinc)
	MA	23	194 (chromium)

MIMICO CREEK GROUP A OUTFALLS (CONT'D)

PRIORITY OUTFALLS OTHER THAN FECAL COLIFORMS

RANKED BY VIOLATIONS AND LOADINGS

NUMBER OF VIOLATIONS	REACH	OUTFALL NUMBER	LOAD AVERAGE (gm/day)
IRON			
6	MB	34	76
	MB	51	17
3	MB	45	1.18×10^3
2	MA	18	211
	MG	509	125
1	MA	23	975
	MC	105	169
	MA	15	80
	ME	137	8

MIMICO CREEK GROUP B OUTFALLS

PRIORITY OUTFALLS FOR FECAL COLIFORM VIOLATIONS
RANKED BY LOADING

REACH	OUTFALL	FECAL COLIFORMS	
		COUNTS/SECONDS	COUNTS/100 ml
MA	19	140443	11235
	18	41500	922
MD	88	12408	2321
ME	133	13293	2100
MG	519	2641800	102000
MH	544	69895	914
	529	14032	4585
	531	11954	319
MI	570	163666	21567
	541	33178	528

MIMICO CREEK GROUP B OUTFALLS (CONT'D)

PRIORITY OUTFALLS OTHER THAN FECAL COLIFORMS

RANKED BY VIOLATIONS AND LOADINGS

NUMBER OF VIOLATIONS	REACH	OUTFALL NUMBR	LOAD AVERAGE (gm/day)
		TKN	
2	MI	554	388
	MI	552	342
	MI	556	317
1	MI	566	959
		IRON	
3	MI	566	239
	MI	570	207
2	MI	554	127
	MI	552	41
	MI	556	41
	MA	21	11
1	MH	531	483
	MB	43	36
	MD	88	28
		PHENOLICS	
2	MI	552	0.05
	MI	556	0.05
1	MG	517	2.45
	MI	554	0.09

APPENDIX VI

FIELD DATA SHEETS

(separate volume)

APPENDIX VII

DATA BASE

(separate volume)

APPENDIX VIII

OUTFALL PHOTOGRAPHS

(separate volume)

APPENDIX IX

METRO TORONTO
SEWER-USE BYLAW

THE MUNICIPALITY
OF METROPOLITAN TORONTO

BILL No.

BY-LAW No. 148-83.

To regulate the discharge of sewage and land drainage in the Metropolitan Area

1. In this by-law:

(a) "area municipality" means the municipality or corporation of the Borough of East York, the City of Etobicoke, the City of North York, the City of Scarborough, the City of Toronto or the City of York;

(b) "biochemical oxygen demand" means the quantity of oxygen utilized in the biochemical oxidation of matter in 5 days at 20 degrees Celsius;

(c) "body of water" means a river, stream, brook, creek, watercourse, lake, pond, spring, lagoon, marsh, canal or other flowing or standing water;

(d) "colour of a liquid" means the appearance of a liquid from which the suspended solids have been removed;

(e) "combined sewer" means a sewer intended to function simultaneously as a storm sewer and a sanitary sewer;

(f) "Commissioner" means the Commissioner of Works of The Municipality of Metropolitan Toronto or his duly authorized representative;

(g) "composite sample" means a sample which is composed of a series of grab samples taken at intervals during the sampling period;

(h) "connection" means that part or those parts of any drain or system of drains leading directly to a public sewer;

(i) "grab sample" is an aliquot of the flow being sampled taken at one particular time and place;

(j) "grease, fat or oil" means any matter which is extractable from a sample by trichlorotrifluoroethane or other designated solvent and can be determined as "oil and grease";

(k) "Inspector" means a person authorized by The Municipality of Metropolitan Toronto to carry out observations and inspections and to take samples as prescribed by this by-law;

(l) "matter" includes any solid, liquid or gas;

(m) "Municipality" means The Municipality of Metropolitan Toronto;

(n) "person" includes a corporation;

(o) "pH" means the logarithm to the base 10 of the reciprocal of the concentration of hydrogen ions in moles per litre of solution;

(p) "phenolic compounds" means those hydroxy derivatives of benzene and its condensed nuclei, which can be determined as "phenols";

(q) "sanitary sewer" means a sewer for the collection and transmission of domestic, commercial and industrial sewage or any of them;

(r) "sewage" means any liquid waste containing animal, vegetable, mineral or chemical matter in solution or in suspension, except uncontaminated water;

(s) "sewage works" means any works for the collection, transmission, treatment or disposal of sewage, or any part of such works;

(t) "sewer" means a pipe, conduit, drain, open channel, ditch or watercourse for collection and transmission of sewage or storm water;

(u) "Standard Methods" means a procedure set out in "Standard Methods for the Examination of Water and Wastewater" published jointly by the American Public Health Association, American Water Works Association and Water Pollution Control Federation, current at the date of testing, or a procedure approved by an analyst of the Ontario Ministry of the Environment;

(v) "storm water" means water from rainfall or other natural precipitation, ground water or water from the melting of snow or ice;

(w) "storm sewer" means a sewer for the collection and transmission of uncontaminated water, storm water, drainage from land or from a watercourse or any of them;

(x) "suspended solids" means a solid matter in or on a liquid which matter is removable by filtering and can be determined as "total nonfiltrable residue";

(y) "uncontaminated water" means any water, including water from a public or private water works, to which no matter has been added as a consequence of its use, or to modify its use, by any person;

(z) "watercourse" means a open channel, ditch or depression either natural or artificial, in which a flow of storm water occurs either continuously or intermittently.

2. No person shall discharge or deposit or cause or permit the discharge or deposit into a sanitary sewer, combined sewer, public or private connection to any sanitary sewer or combined sewer, matter of any type or at any temperature or in any quantity which may be or may become harmful to a sewage works, or which may interfere with the proper operation of a sewage works, or which may impair or interfere with any sewage treatment process, or which may be or may become a hazard to persons, animals or property.

3. No person shall discharge or deposit or cause or permit the discharge or deposit into a sanitary sewer, combined sewer, public or private connection to any sanitary sewer or combined sewer any of the following:

(a) Matter of a type or quantity that has or may emit a toxic or poisonous vapour or a chemical odor which may interfere with the proper operation of a sewage works, or sewage containing any one or more of the following: bromine, carbon disulphide, hydrogen sulphide, formaldehyde or pyridine;

(b) Gasoline, benzene, naphtha, fuel oil or other flammable or explosive matter or sewage containing any of these in any quantity;

(c) Sewage having pH less than 6.0 or greater than 10.5;

(d) Sewage of which the biochemical oxygen demand exceeds 500 milligrams per litre;

(e) Sewage containing more than 600 milligrams per litre of suspended solids;

(f) Sewage containing more than 150 milligrams per litre of grease, fat or oil;

(g) Sewage which consists of two or more separate liquid layers;

(h) Atomic wastes and radioactive materials except as may be permitted under the Atomic Energy Control Act (Canada) currently in force and regulations thereunder;

(i) Sewage at a temperature greater than 65 degrees Celsius;

(j) Storm water or uncontaminated water, except that which may be discharged into a combined sewer, unless the discharge into a sanitary sewer is permitted by the area municipality;

(k) Sewage containing any of the following matter in excess of the indicated concentrations:

Matter	Concentration in Milligrams per Litre	Expressed as
Aluminum	50	Al
Arsenic	1.0	As
Barium	5.0	Ba
Cadmium	2.0	Cd
Chloride	1500	Cl
Chromium	5.0	Cr
Copper	5.0	Cu
Cyanide	2.0	CN
Fluoride	10	F
Iron	50	Fe
Lead	5.0	Pb
Mercury	0.1	Hg
Nickel	5.0	Ni
Phenolic compounds	1.0	
Phosphorus	100	P
Sulphate	1500	SO_4
Sulphide	2.0	S
Tin	5.0	Sn
Zinc	5.0	Zn

The presence in sewage of any one of the matters on this list in a concentration in excess to its limit consititutes a separate offence.

4. No person shall discharge or deposit or cause or permit the discharge or deposit into a storm sewer, land drainage works, watercourse, public or private connection to any storm sewer, matter of any type or at any temperature or in any quantity which may interfere with the proper operation

of a storm sewer, or which may obstruct a storm sewer or the flow therein, or which may be or may become a hazard to persons, animals or property, or which may impair the quality of the water in any well, reservoir or other body of water.

5. No person shall discharge or deposit or cause or permit the discharge or deposit into a storm sewer, land drainage works, watercourse, public or private connection to any storm sewer any of the following:

   (a) Any matter that has or may emit an offensive odour which causes or is likely to cause harm or material discomfort to any person or damage to property or to plant and animal life;

   (b) Gasoline, benzene, naphtha, fuel oil or other flammable or explosive matter or sewage containing any of these in any quantity;

   (c) Sewage having a pH less than 6.0 or greater than 9.5;

   (d) Sewage of which the biochemical oxygen demand exceeds 15 milligrams per litre;

   (e) Sewage containing more than 15 milligrams per litre of suspended solids;

   (f) Sewage containing more than 15 milligrams per litre of grease, fat or oil;

   (g) Sewage which consists of two or more separate liquid layers;

   (h) Atomic wastes and radioactive materials except as may be permitted under the Atomic Energy Control Act (Canada) currently in force and regulations thereunder;

   (i) Sewage or uncontaminated water at a temperature greated than 65 degrees Celsius;

   (j) Sewage containing coloured matter, which sewage would require a dilution in excess of 4 parts of distilled water to 1 part of such sewage to produce a mixture the colour of which is not distinguishable from that of distilled water;

   (k) Sewage containing any matter which will not pass through a screen having openings not larger than 3.35 millimetres square (No. 6 standard sieve);

(l) Sewage containing any of the following matter in excess of the indicated concentrations:

Matter	Concentration in Milligrams per Litre	Expressed as
Aluminum	1.0	Al
Ammonia	10.0	N
Arsenic	1.0	As
Barium	1.0	Ba
Cadmium	0.1	Cd
Chlorine	1.0	Cl_2
Chromium	1.0	Cr
Copper	1.0	Cu
Cyanide	0.1	CN
Fluoride	2.0	F
Iron	1.0	Fe
Lead	1.0	Pb
Manganese	1.0	Mn
Mercury	0.001	Hg
Nickel	1.0	Ni
Phenolic compounds	0.02	
Phosphorus	1.0	P
Tin	1.0	Sn
Zinc	1.0	Zn

The presence in sewage of any one of the matters on this list in a concentration in excess of its limit constitutes a separate offence.

6. (a) For the purpose of determining the characteristics of the sewage to which reference is made in this by-law, one sample alone is sufficient and without restricting the generality of the foregoing the sample may be a grab sample or a composite sample, may contain additives for its preservation and may be collected manually or by using an automatic sampling device;

(b) Except as otherwise specifically provided in this by-law, all tests, measurements, analyses and examinations of sewage, its characteristics or contents shall be carried out in accordance with Standard Methods;

(c) For each one of the following metals: aluminum, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, tin and zinc, whose concentration in sewage is limited in Sections 3(k) and 5(l), the analysis shall be for the quantity of total metal, which includes all metal both dissolved and particulate.

7. (a) The owner or occupant of commercial, institutional or industrial premises with one or more connections to a public sewer shall install and maintain in good repair in each connection a suitable manhole to allow observation, sampling and measurement of the flow of sewage therein, provided that where installation of a manhole is not possible, an alternative device or facility may be substituted with the approval of the Commissioner;

(b) Every manhole, device or facility installed as required by Section 7(a) of this by-law shall be designed and constructed in accordance with good engineering practice, and shall be constructed and maintained on the lands of the owner or occupant of the premises at his expense;

(c) The owner or occupant of commercial, institutional or industrial premises shall ensure that every manhole, device or facility installed as required by Section 7(a) of this by-law is accessible at all reasonable times for the purposes of observing, sampling and measuring the flow of sewage therein.

8. (a) The discharge or deposit of sewage that would otherwise be prohibited by this by-law may be permitted in the sanitary or combined sewer or a sewage works to an extent fixed by agreement with the Municipality under such conditions with respect to payment or otherwise as may be necessary to compensate for any additional costs of treatment;

(b) A person who has entered into an agreement with the Municipality with respect to the discharge or deposit of sewage shall not be prosecuted under this by-law for the discharge or deposit of sewage in accordance with the terms of that agreement.

9. (a) The owner or occupant of commercial, institutional or industrial premises may submit to the Commissioner a program to prevent or to reduce and control the discharge or deposit of sewage or uncontaminated water from those premises into connections to a sewage works or to a storm sewer;

(b) The Commissioner may issue an approval to be known as a 'program approval' to the person who submitted the program;

(c) A person to whom a program approval has been issued shall not be prosecuted under this by-law for the discharge or deposit of sewage during the period within which the program approval is applicable provided that the person complies fully with the terms of the program approval.

10. No person shall prevent, hinder, obstruct or interfere in any way with the Commissioner or an Inspector, bearing proper credentials and identification, from:

(a) Entering in or upon any land or premises, except land or premises being used as a dwelling house, at any reasonable time;

(b) Making such tests or taking such samples as he deems necessary; or

(c) Inspecting or observing any plant, machinery, equipment, work or activity for the purposes of administering or enforcing this by-law.

11. No person shall break, damage, destroy, deface or tamper with:

(a) Any part of a public sewage works;

(b) Any device whether permanently or temporarily installed in a public sewage works or connection to a public sewer for the purpose of measuring, sampling and testing of sewage, storm water or uncontaminated water.

12. (a) Every person who contravenes any provison of this by-law is guilty of an offence and on conviction is liable to a fine of not more than $2,000 for every day or part thereof upon which such offence occurs or continues;

(b) Any person convicted under this by-law shall forfeit and pay for a breach of any provision of this by-law a minimum penalty of $500 exclusive of costs for the first offence, a minimum penalty of $750 exclusive of costs for the second offence and a minimum penalty of $1,000 exclusive of costs for each subsequent offence;

(c) It is the intention of this by-law that all offences created herein are deemed to be of absolute liability.

13. By-law 2520 "To regulate the discharge of sewage and land drainage in the Metropolitan Area", as amended, is hereby repealed.

ENACTED AND PASSED this 14th day of October, A.D. 1983.

W.J. LOTTO,
Metropolitan Clerk.

PAUL V. GODFREY,
Chairman.

(Corporate Seal)